Santa Clara Valley Water District

Final Engineer's Report
Jacques Gulch Restoration Project

Aspen Environmental Group
LEE, Incorporated
Clearwater Hydrology
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Northgate Environmental Management

August 2008

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SANTA CLARA VALLEY WATER DISTRICT

Jacques Gulch Restoration Project

Final Engineer's Report
Project No. 91854002

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SANTA CLARA VALLEY WATER DISTRICT

Jacques Gulch Restoration Project

Final Engineer's Report
Project No. 91854002

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The Engineer's Report has been prepared under the direct supervision of the undersigned, who hereby certifies that he is a Registered Civil Engineer in the State of California.

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Executive Summary

This Engineer's Report provides information about the Jacques Gulch Restoration Project (Project) and project site. It describes why the Project is being undertaken, its goals and objectives, how conceptual alternatives were identified and evaluated, and the final project alternatives leading to the recommended project. The Project fulfills an obligation of the Santa Clara Valley Water District (District) under a Consent Decree[1] agreed to by the District, other responsible parties, and state and federal agencies with natural resource trustee responsibilities (Trustee agencies). The District is acting on behalf of itself and other parties to the decree.

The Project is located in Santa Clara County, at Almaden Quicksilver County Park (Park). It has two primary aims: to remove or cap visible calcine[2] that has migrated down slope into Jacques Gulch and to restore the creek and adjacent lands by reestablishing the creek channel and restoring a riparian habitat similar to what once existed in the disturbed area. The Project is on two sites, separated by about 550 feet of an unaffected reach of Jacques Gulch. Site A, at the intersection of Alamitos Road and Hicks Road, extends 650 feet upstream from Almaden Reservoir and covers a work area of approximately 2.1 acres. Site B is on an unnamed tributary to Jacques Gulch located approximately 1,200 feet upstream from Alamitos Road. Site B extends approximately 1,400 feet up this tributary and covers a work area of approximately 1.9 acres. The project area drains to Almaden Reservoir through an existing culvert under Alamitos Road. The project sites are on Park land, except a portion of Site A, which is on District land. Land use surrounding the project is open space; there is little private land in close proximity to the Project.

Alternative ways of achieving the Project's objectives were identified and evaluated. These alternatives reflect the specific requirements of the Consent Decree, site conditions, and project objectives. They were based on discussions among District staff, a consultant team engaged by the District, and representatives of the Trustee agencies. The Almaden Quicksilver Restoration Plan and Environmental Assessment (Restoration Plan), prepared by the Trustees agencies, specifies goals and objectives for the projects identified in the plan. A Favored Approach to the Jacques Gulch restoration was identified in the plan. The Recommended Project in this Engineer's Report meets the objectives of the Favored Approach.

Design elements in the Project address a number of specific needs: to remove visible calcine; to restore physical processes and riparian habitat; to construct an energy dissipater in Almaden Reservoir at the Jacques Gulch culvert outfall; to address an embankment erosion problem on Hicks Road; and to replace the existing culvert under Alamitos Road with an 84-inch RCP. Consideration was given as well to construction of a temporary sediment basin in lower Site A.

The Engineer's Report leads to a Recommended Project that will remove visible calcine and transport it to an existing consolidation site in the Park; establish the creek channel in a stable alignment, including installation of in-stream and bank protection; excavate, repair, and protect eroding banks; construct a temporary sediment basin; plant native plants along the creek corridor; install a new culvert under Alamitos Road with an energy dissipater at its outfall; and install bank protection on both sides of Alamitos Road near the culvert. The total preliminary opinion of the cost of the Recommended Project is $4.9 million, including construction, post-construction monitoring, engineering, and construction administration.

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[1] A Consent Decree is a judicial order that resolves one or more issues in a case. It is negotiated by and agreed to by the parties to the case, under the supervision of the presiding judge. Once finalized and approved by the judge, it has the force of a court order.

[2] Calcine is residual waste rock left after treatment of an ore with high temperature. In mercury processing, calcination of the mercury-bearing ore cinnabar involves heating the ore to a temperature sufficient to release mercury vapor, which is then collected.

Chapter 1. Introduction

1.1 Purpose of this Project

The purpose of the Jacques Gulch Restoration Project (Project) is to reduce mercury loading to the Guadalupe River watershed. This is to be done through removal and/or capping of calcine found at two sites in Jacques Gulch, upstream of Almaden Reservoir. Calcine is the waste material left after processing the mercury-bearing ore cinnabar. Calcine left from historic ore processing on Mine Hill has migrated down slope into Jacques Gulch. The regional location of the project is shown in Figure 1-1. The project site is located in southern Santa Clara County above Almaden Reservoir, in the headwaters of Alamitos Creek, which is a tributary to Guadalupe River.

Jacques Gulch drains about 1.4 square miles bounded by Mine Hill to the northeast, Jacques Ridge to the northwest, and Bald Mountain to the southwest. The area receives an average of about 34 inches of rain per year. The Jacques Gulch drainage is immediately upstream of Almaden Reservoir, which it enters via a culvert under Alamitos Road at Hicks Road. Two separate areas were identified for restoration and enhancement. These are shown in Figure 1-2. Site A, in the lower part of the Jacques Gulch drainage, extends from Alamitos Road west (upstream) for approximately 650 feet near the north side of Hicks Road. It varies in width from approximately 85 to 140 feet, with the wider area at the eastern or downstream portion of the site. Site B is a steep narrow drainage on an unnamed tributary on the southwest side of Mine Hill. It is approximately 1,400 feet long and varies between in width from 35 to 85 feet, with the broader area in the lower reach of the site, near where it joins the main stem of Jacques Gulch. The two sites are separated by a densely vegetated 550-foot reach of the Jacques Gulch main stem. This intervening reach is not part of the restoration project. Figure 1-2 shows the project limits at each site. The area of disturbance at Site A will cover 2.1 acres and at Site B 1.9 acres.

The visible calcine in the two sites is to be removed. Drawings showing the extent of the calcine at Sites A and B are found in Appendix A. It will be consolidated and capped at an approved site in the Park, where calcine from other areas in the Park have been consolidated and capped previously. Figure 1-3 shows the project sites in relation to the community of New Almaden, potential calcine haul routes, and the calcine consolidation area. Entrances to the Park are at Hicks and Wood Roads and at Hacienda Furnace Yard, near New Almaden. Following excavation and removal of the calcine, the project sites will be graded to create a geomorphically stable channel, and the land prepared for habitat restoration. The creek channel will be reestablished and stabilized, and native vegetation will be reestablished to create new riparian habitat.

1.2 Structure of this Report

The Santa Clara Valley Water District (District) has prepared this Engineer's Report for the Jacques Gulch Restoration Project in accordance with Section 10 of the District Act, which requires such a report for projects undertaken by the District. This report includes

- **Chapter 1.** General background information, defining the problems to be solved, describing the project, identifying goals and objectives, and noting permits required
- **Chapter 2.** Information on projects, programs, and regulations pertinent to the project
- **Chapter 3.** Background on site conditions, including geomorphology, hydrology, hydraulics, groundwater, soils, plants and animals, land use, and cultural resources
- **Chapter 4.** Discussion of the process used to identify and evaluate conceptual site alternatives for meeting project goals and objectives

- **Chapter 5.** Evaluation of alternatives, information of costs and construction difficulties, and recommendation of the final project

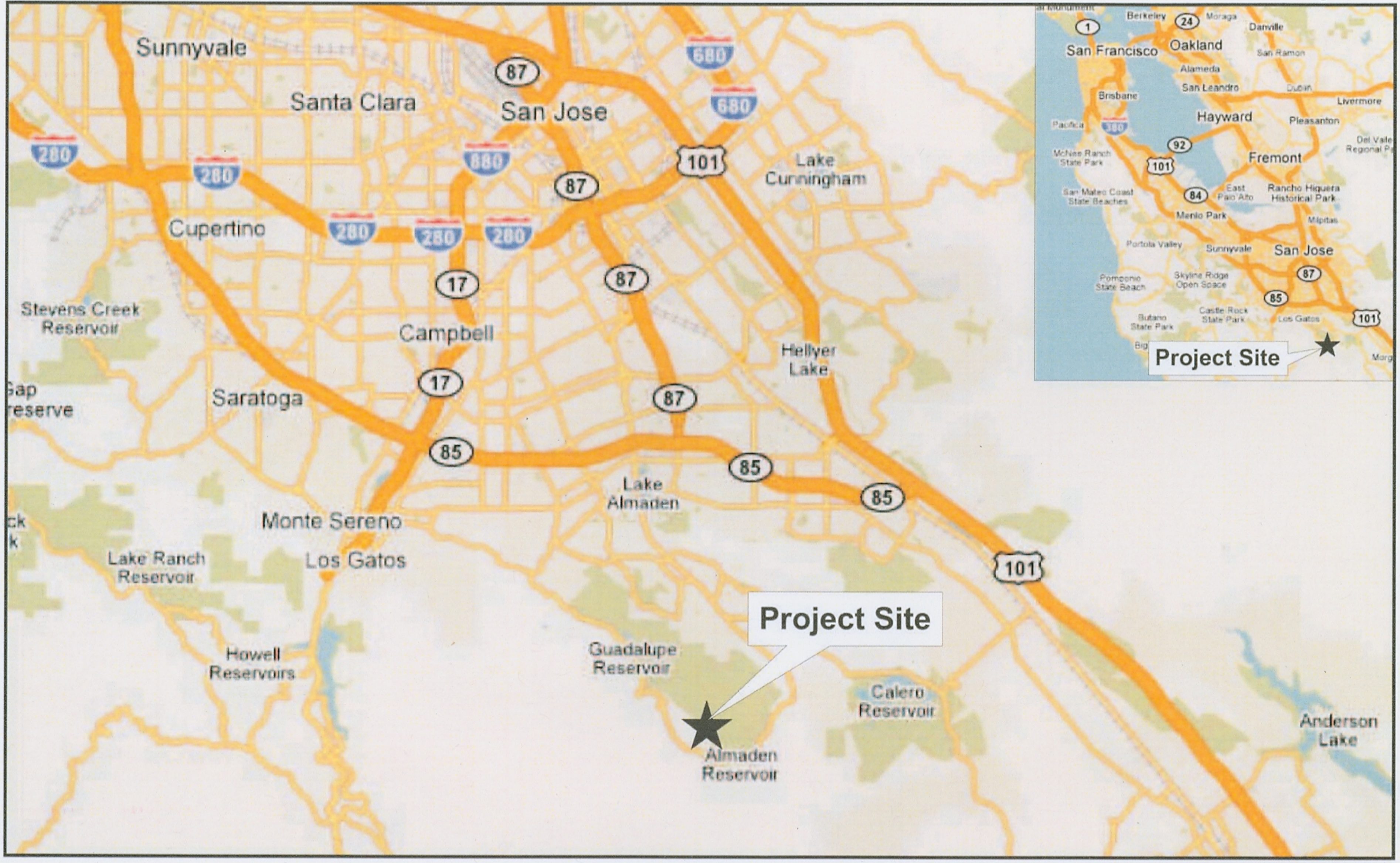
1.3 Background

Almaden Quicksilver County Park covers 3,147 acres on Los Capitancillos Ridge in the northeastern Santa Cruz Mountains. The Park is located approximately 12 miles south of downtown San Jose. From about 1845 to the 1970s, mining and processing cinnabar were conducted on land now within the Park. The central mining and processing area was atop Mine Hill. Extracting mercury from cinnabar involved heating the ore to 700 to 1,200 degrees Fahrenheit in furnaces and retorts. This process released mercury as a vapor. The volatized mercury was then condensed into liquid form. The residual material left, calcine, was typically dumped near the processing area, including the hillslopes above Jacques Gulch. During infrequent large rainstorms, water and gravity transported the calcine from Mine Hill in the form of debris flows. The calcine was transported down an unnamed tributary to Jacques Gulch and the main stem of Jacques Gulch, coming to rest in these drainages. Subsequent channel incision and erosion has reworked the calcine, providing an ongoing source of sediment downstream.

In February 2000, the Department of the Interior (DOI) U.S. Fish and Wildlife Service (USFWS) issued a Preassessment Screening Determination (PSD) for the Park with regard to injuries to natural resources arising from historical and continuing releases of mercury and other metals from historic mining within the Guadalupe River watershed. Under the federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), authorized officials that are natural resource trustees must issue a PSD before proceeding with a Natural Resource Damage Assessment (NRDA). The NRDA is used to establish damages and seek restitution. Damages are monetary compensation for injury, and any recovery is to be used for restoration. The PSD is to provide a rapid review of available information on resources that might have been injured by releases of hazardous substances. Based on the PSD that was prepared, the trustees determined that they had a reasonable probability of making a successful natural resource damage claim, and that proceeding with an NRDA was warranted. An NRDA was never prepared and issued. Rather, subsequent to the PSD, the trustees and potentially responsible parties entered into discussions. In September 2001, a Cooperative Agreement was entered into by some of the Trustees and settling defendants. These negotiations identified five projects that would be undertaken by the potentially responsible parties. Three of these were compensation projects and two were restoration projects. It was agreed that successful completion of these projects would resolve the damages claimed by the government.

A Consent Decree was entered into by the trustees and the potentially responsible parties, including the District, to settle the matter. The Jacques Gulch Project is one of the two restoration projects identified in the decree. The area affected by the Project is to be restored to a natural condition after visible calcine is removed or capped. The District does not own the property in Jacques Gulch and was not responsible for historic mining, but on behalf of the parties the District is undertaking the work using funds provided by the defendants.

The Consent Decree stipulates that "[t]o restore or rehabilitate the allegedly injured natural resources, the Responsible Settling Defendant(s)...shall properly consolidate and cap onsite those calcine tailings piles identified in the area below Mine Hill known as Jacques Gulch...and further shall remove non-native plants, revegetate with native plants, and otherwise enhance the riparian habitat..." (Section VI, part b.)



Source: Google Maps, 2006.

Figure 1-1
Regional Location

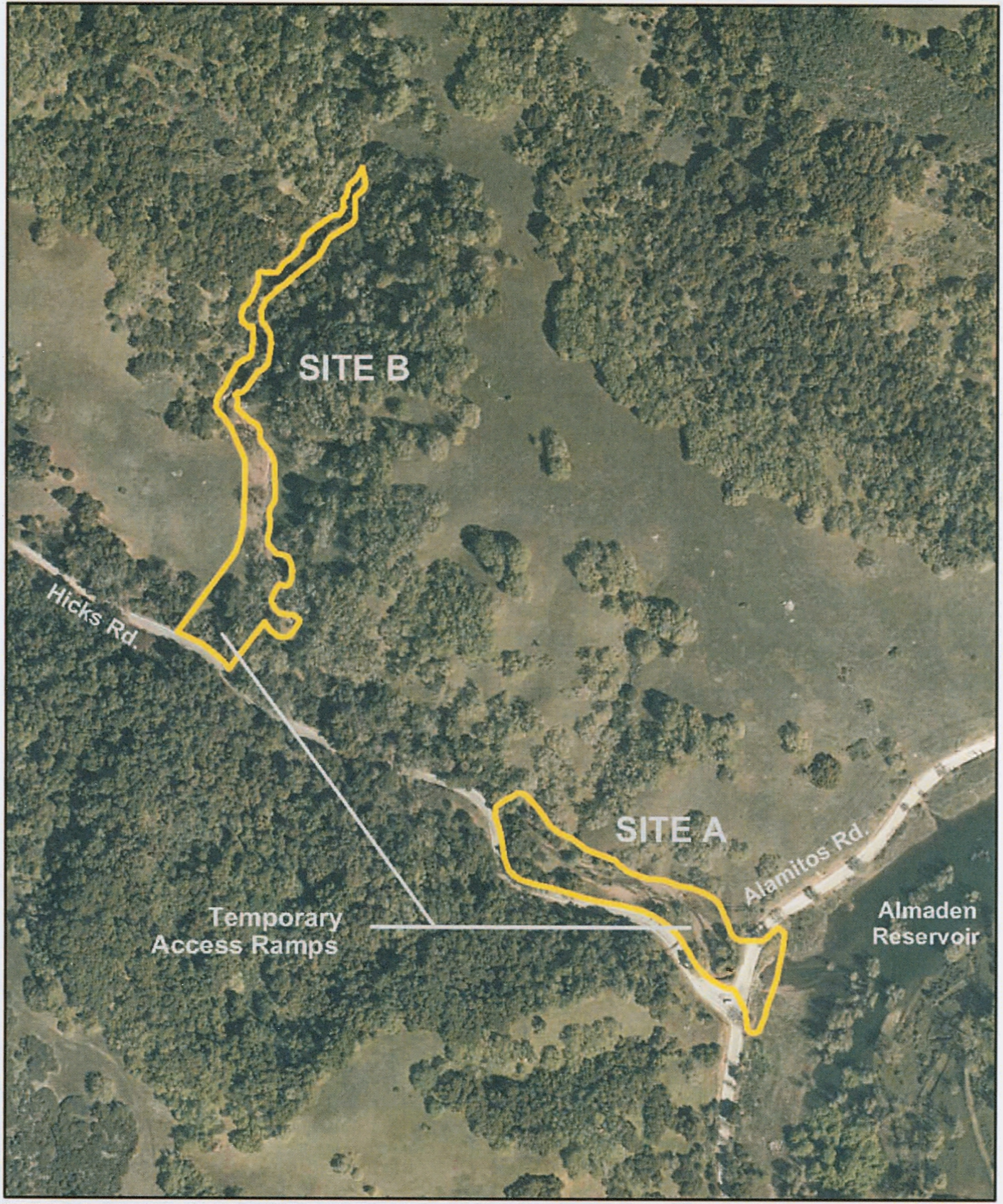
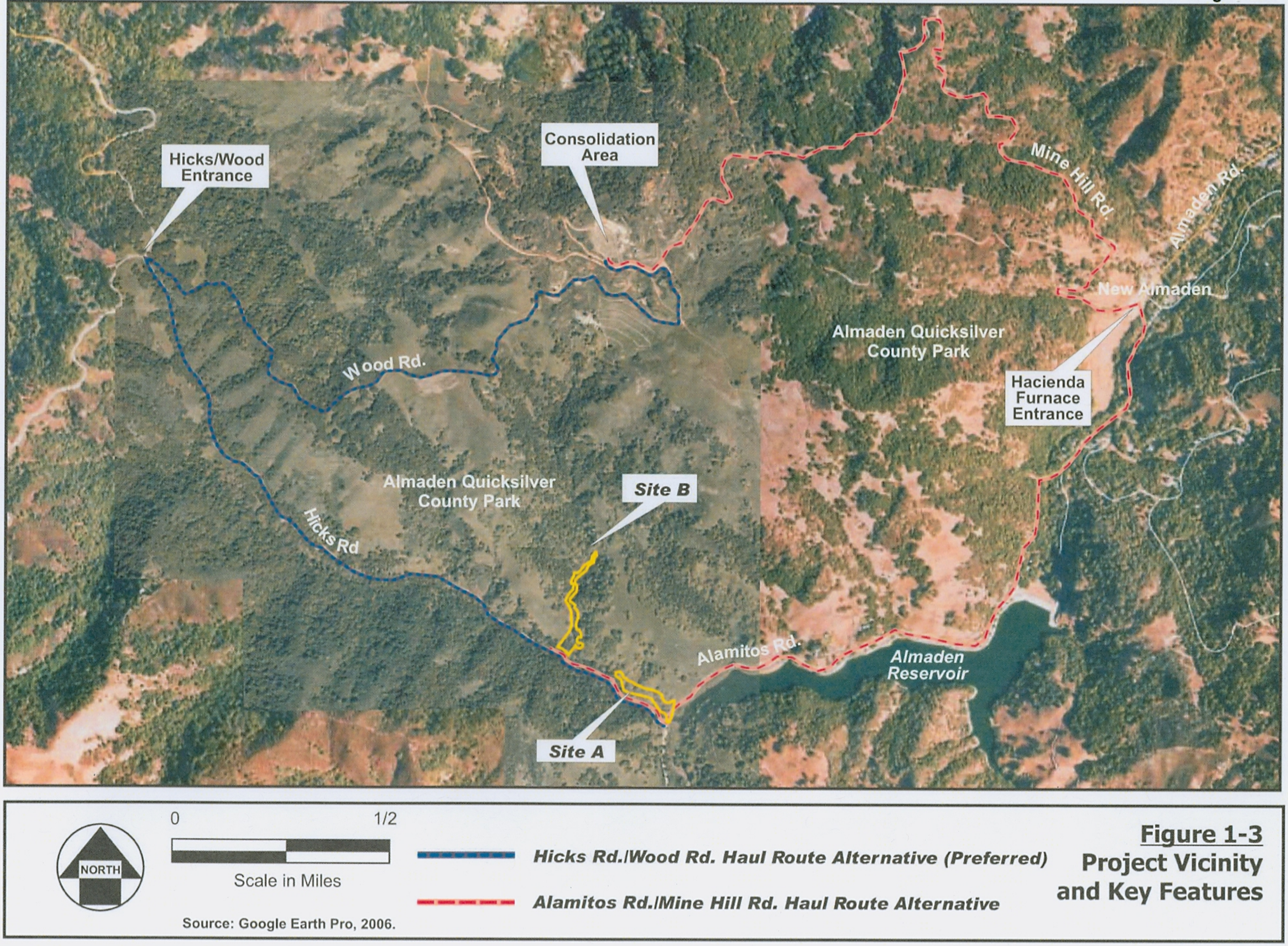


Figure 1-2
Sites A and B Project Limits


Hicks/Wood Entrance
Consolidation Area
Mine Hill Rd
Almaden Rd.
New Almaden
Almaden Quicksilver County Park
Hacienda Furnace Entrance
Wood Rd.
Almaden Quicksilver County Park
Site B
Hicks Rd
Alamitos Rd.
Almaden Reservoir
Site A
NORTH
0
1/2
Scale in Miles
Hicks Rd./Wood Rd. Haul Route Alternative (Preferred)
Alamitos Rd./Mine Hill Rd. Haul Route Alternative

Source: Google Earth Pro, 2006.

Figure 1-3
Project Vicinity and Key Features

As a part of the Consent Decree, the Almaden Quicksilver County Park Restoration Plan and Environmental Assessment (Plan) was prepared and issued in draft in January 2005 (USFWS 2005). This Plan recounts the process used to identify the five projects and lays out the goals and objectives of each project, as well as the evaluation and success criteria. For Jacques Gulch, the Plan requires that "[a]ll visible calcine material will be removed, consolidated, and capped at the Mine Hill area of the Park and/or trapped and/or stabilized in place" (p. 25)

1.4 Problem Definition

Mercury found in the Guadalupe River watershed and San Francisco Bay is a legacy of historic mining and ore processing in the New Almaden mining district. However, sources of this contamination are not uniformly distributed in the watershed. Jacques Gulch and Hacienda Furnace Yard, near the community of New Almaden, were identified as major sources. Hacienda Furnace Yard and several other locations within the Park have undergone remediation by the County, including both removal and capping of calcine. This material has been consolidated and capped at San Francisco Cut, the Consolidation Area within Park property approved for this purpose (see Figure 1-4).

The problems at Sites A and B are two-fold: first, the sites act as on-going sources of mercury to downstream locations and, second, the natural and ecological functions of the sites are impaired by the presence of the calcine deposits that have covered a large part of the riparian habitat once found along these drainages. Addressing these problems requires implementing a cost-effective project that (1) prevents existing visible calcine from continuing to be exposed to erosive water flows and (2) restores the project area to a natural riparian condition.

1.5 Restoration Strategy and Project Identification

The overall strategy to reduce the sources of mercury in the watershed has involved identification of contamination pathways, identification and characterization of contamination sources, and screening of sources to identify those where removal or sequestration of calcine would be most effective in reducing or eliminating ongoing contamination. In reaching an agreement on the Consent Decree, the parties established the Almaden Quicksilver Restoration Plan. One outcome of this effort was the identification of the two Jacques Gulch sites as continuing contamination sources. With identification of the sites, a specific project can be designed that accomplishes the project's goals.

1.5.1 Evaluation Criteria

The project participants (i.e., parties to the Consent Decree) identified four threshold criteria to apply to potential restoration alternatives in order to identify alternatives that would achieve a minimum level of acceptability. Additional criteria were then applied to acceptable potential alternatives in order to identify final alternatives.

Criteria used to establish a threshold that a potential alternative had to meet in order to be considered further included:

1. **Technical Feasibility.** The alternative had to be technically sound. Demonstrated success of projects using a similar restoration technique was an important characteristic.
2. **Consistency with Trustee Restoration Goals.** The alternative needed to meet the Trustees' intent to restore, replace, enhance, or acquire the equivalent to the injured resources or the services those resources provided.

3. **Compliance with Laws.** The alternative had to comply with all applicable laws.
4. **Public Health and Safety.** The alternative could not pose a threat to the health and safety of the public.

If a proposed alternative met these threshold requirements, additional criteria were used to evaluate the alternative further. These criteria included:

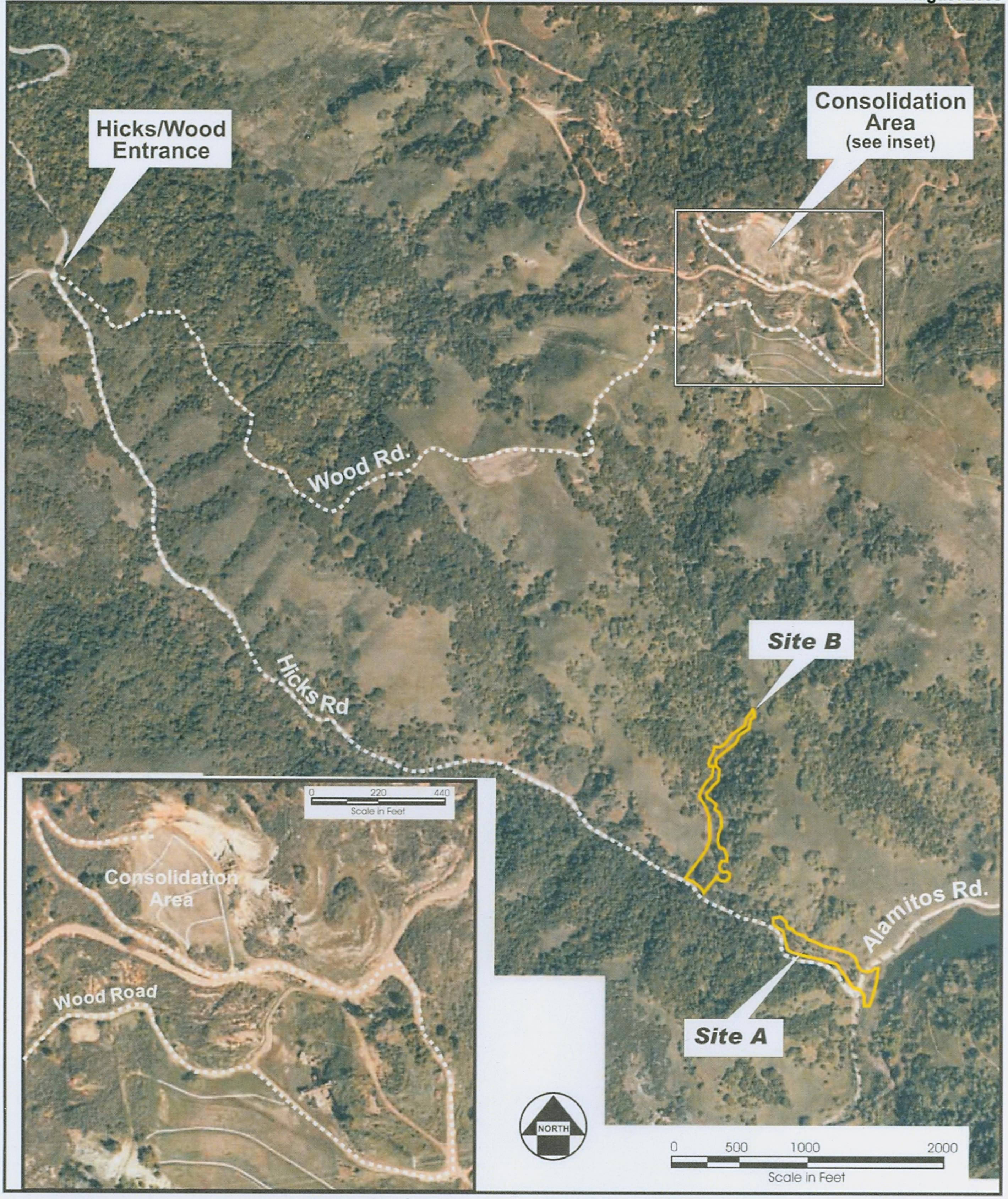
1. **Relationship to Injured Natural Resources and Services.** Preference was given to alternatives that addressed injured resources and services over those that benefited resources or services others than those injured.
2. **Avoidance of Further Injury.** Alternatives should avoid or minimize adverse impacts to the environment.
3. **Likelihood of Success.** The potential for success and the expected level of the return of resources and resource services were considered. Additional considerations included the ability to monitor and evaluate success; the ability to correct any problems arising during the project; and the capability of individuals or organizations to implement the alternative
4. **Multiple Resource Benefits.** The extent to which an alternative benefited more than one natural resource or service was considered.
5. **Time to Provide Benefits.** The time expected for the alternative to begin providing benefits was considered.
6. **Duration of Benefits.** The expected duration of benefits from a proposed alternative was considered.
7. **Use of Publicly Owned Lands.** The use of public lands was preferred to private lands.
8. **Opportunities for Collaboration.** The possibility of enhancing natural resource benefits through coordination of restoration projects with other ongoing or proposed projects or programs was considered.
9. **Benefits Relative to Costs**. The relationship of resource and service benefits to expected costs was considered.
10. **Total Cost and Accuracy of Estimate.** The estimated total cost of an alternative and the validity and reliability of the estimate were considered.

Based on this evaluation of all potential alternatives, five projects were identified for implementation and described in the Almaden Quicksilver Restoration Plan.

1.5.2 Selected Alternatives: Almaden Quicksilver Restoration Plan

The Jacques Gulch Restoration Project is one of the five projects identified in the Plan. Including the Project, the five are:

- Restoration and enhancement of Jacques Gulch,
- Restoration and enhancement of Hacienda Furnace Yard,
- Eradication of giant reed (*Arundo donax*) and development of habitat enhancement on Coyote Creek,
- Removal of fish passage impediments at Hillsdale Bridge, and
- Reduction of predation pressures on the California clapper rail at Ravenswood marsh.



Source: Google Earth, 2006

Figure 1-4
Project Sites, Haul Route, and Consolidation Area

The Jacques Gulch and Hacienda Furnace Yard projects are considered primary restoration projects, intended to remove or sequester calcine and restore these areas. The other three projects are considered compensatory projects, compensating for resources potentially diminished by mercury contamination from historic mining operations.

1.6 Goal and Objectives

1.6.1 Goal

The goal of the Jacques Gulch project is two-fold. It is to:

> *Reduce mercury loading to the Guadalupe River watershed by removal/consolidation, trapping and consolidation or removal, and/or onsite stabilization of visible mercury-containing calcine and sediments and restoration of riparian habitat within the Jacques Gulch drainage at and upstream of its confluence with Almaden Reservoir. (USFWS, 2005, p.23)*

1.6.2 Objectives

To achieve the project goal, four objectives were identified in the Plan:

i. Prepare an Engineer's Report and, if an alternative other than the Favored Approach is recommended, propose [a] specific alternative approach (including a water quality monitoring program) for restoration of Jacques Gulch.
ii. Remove/consolidate and/or control calcine and regrade the project area to [a] stable condition, and, if an alternative other than the Favored Approach is pursued, implement water quality monitoring.
iii. Import clean substrate for plant growth.
iv. Vegetate the area with riparian and/or seasonal wetland species.

1.7 Favored Approach

In the Almaden Quicksilver Park Restoration Plan, a preferred approach to the project was identified. This is called the Favored Approach in the Plan. The Favored Approach to the Project is to remove the visible calcine and then consolidate, encapsulate, and stabilize the removed calcine and mining debris with material consolidated and capped on Mine Hill during earlier remedial action at the Park.

However, under the Plan other potential approaches that satisfy the intent of the project may be evaluated. These include:

- Trapping and periodically removing mercury-bearing materials
- Stabilizing and capping calcine and mining debris in place
- Using other potential management methods that can withstand high-energy flow conditions

Soil stabilization methods will be evaluated on a site-specific basis and may include

- Excavation of calcine and replacement as needed with imported material
- Stabilization of calcine with structural or biological materials
- Contouring
- Capping calcine with clean fill

The use of riprap and other hardscape materials in stream rehabilitation is to be avoided to the extent practicable.

For any approach other than the Favored Approach, the Engineer's Report must consider and propose the location(s), frequency, and methods for periodic water quality monitoring necessary to ensure that mercury concentrations in water entering Almaden Reservoir meet applicable regulatory requirements.

All approaches will propose designs to maximize habitat value and minimize erosion. This may include importing sufficient substrate to help support vegetation. Revegetation will use native plant materials that serve to maximize habitat value and that are likely to become self-sustaining. Maintenance will be performed as needed during the period of native vegetation re-establishment. Monitoring and, if necessary, replanting will be conducted for up to three years following construction.

1.8 Project Concepts

Problems to be solved by potential Jacques Gulch project alternatives include:

- Determining which areas of visible calcine should be
    a. Removed
    b. Capped in place
    c. Left undisturbed, but managed through use of appropriate catch basins.
- Designing caps, contours, and channel alignments that protect against erosion and transport any calcine intentionally left on-site
- Identifying and designing stream channel and bank conditions that will yield a stable or naturally evolving waterway that does not damage or put at risk capped areas
- Assessing the benefits of calcine removal against the impacts of vegetation removal, especially trees and tree canopy
- Identifying construction techniques and haul routes
- Determining if there are any limitations on construction procedures (e.g., site access, temporary storage of excavated material on site prior to hauling off site, etc.)
- Determining the location, size, and characteristics of any required sediment retention facility
- Determining the requirements and design features of a new culvert under Alamitos Road discharging to Almaden Reservoir
- Determining the requirements and design features of an energy absorbing surface at the outfall of the new culvert
- As required, establishing a monitoring program for parameters of concern, including water quality, biology, and stream morphology.

1.9 Execution of the Restoration

Site A is readily accessible from Hicks Road and/or Alamitos Road and is sufficiently small and level that the construction period will be relatively short. Site B is not as readily accessible. Excavation there is likely to require smaller equipment working in less ideal conditions than are found at Site A, likely resulting in a longer construction period there. In the Almaden Quicksilver Restoration Plan, it was estimated that construction at Site A would take between 6 and 10 weeks, and construction at Site B would take between 10 and 13 weeks. However, based on the amount of calcine, the excavation and removal are estimated by the District to take longer. The overall construction period, including revegetation, is estimated to be on the order of 26 weeks. Construction will be conducted in accordance with the requirements of resource agencies with regard to resource protection and seasonal restrictions, if any.

1.10 Probability of Success

The probability of success is aided by the project's location. The Project is in a part of the Park that is undeveloped and not readily accessible to the public. Access is discouraged by a barbed wire fence along Hicks Road and a lack of parking. The relative inaccessibility of the site improves the potential for successful revegetation and habitat development. Existing native habitat upstream of the project sites and in other areas in the vicinity suggests that plantings can be successfully established, creating terrestrial and aquatic habitats. In large part, native soils underlying the sites are visually distinct from calcine deposits. This characteristic of the calcine deposits facilitates identification of material for removal or capping.

1.10.1 Success Criteria

Success in achieving the project's goals will be determined by criteria that have measurable components. The measurement may be specific in terms of quantities or numbers, or may be relative to existing conditions on-site or elsewhere.

Goal 1

Calcine deposits are addressed in a manner such that they no longer act as a substantial source of mercury in the Guadalupe River watershed. This is achieved through one or more of the following mechanisms:

- Removing visible calcine from Sites A and B and consolidating, stabilizing, and capping this material at the Mine Hill area of the Park, and/or
- Trapping and managing the calcine-rich sediment before it migrates downstream from Jacques Gulch, and/or
- Stabilizing and capping the calcine in place.

Performance Criteria for Goal 1

- Visible calcine has been removed, consolidated, and encapsulated in accordance with any DTSC-imposed requirements or,
- Visible calcine has been trapped and managed before migrating downstream, and water quality monitoring confirms that mercury is not being released to the Guadalupe River watershed in excess of applicable regulatory requirements or,
- Visible calcine has been stabilized or capped in place and water quality monitoring confirms that mercury is not being released to the Guadalupe River watershed in excess of applicable regulatory requirements.

Performance Measurements for Goal 1:

- The proportion of the calcine removed from Sites A and B, as compared to the amount of visible calcine estimated to occur at the two sites presently.

- Mercury in water and sediment leaving the project area following project conclusion meets established applicable regulatory requirements, as demonstrated by a water quality sampling program.
- The long-term integrity and effectiveness of all stabilization or capping as demonstrated by annual inspections.
- The project decreases, or does not increase, peak flows leaving the project site.

Goal 2

The drainage channel and floodplain are returned to a natural condition and native plant materials have been successfully established, creating a self-sustaining riparian habitat appropriate to restored site conditions and the ecology of the region.

Performance Criteria for Goal 2:

- Stream channel conditions have stabilized.
- Native plants have become established and wildlife has colonized the restored sites.
- The restored areas are similar in character to other natural areas in the vicinity.

Performance Measurements for Goal 2:

- Stream bed adjustments and bank erosion are minimal. This measurement will be performed and reported annually for up to three years, or longer as needed, to confirm success.
- The survival rate of planted vegetation is within acceptable ranges established by resource agencies and the diversity of wildlife is reasonable given habitat conditions. This measurement will be performed and reported by a qualified biologist who inspects the sites. Supplemental or additional plantings have been undertaken where survival is less than agreed. Inspections will be undertaken annually for up to three years, or longer as needed, to confirm success.
- The restored sites compare favorably with other habitat in like circumstances in the project vicinity, as determined and reported annually by a qualified biologist. Inspections will be undertaken annually for up to three years, or longer as needed to confirm success.

1.11 Reporting

The results of any inspections and sampling required subsequent to Project construction will be reported in written form and submitted to the District and others designated in the Consent Decree. A water quality monitoring report will be prepared annually (for an approach other then the Favored Alternative). Success in vegetation and habitat establishment and in drainage way and floodplain conditions will be reported annually, either in separate reports or a single report.

1.12 Consultation and Permits

During the course of the preparation of the Engineer's Report, meetings and discussions were held with representatives of the New Almaden community as well as representatives of the U.S. Fish and Wildlife Service, California Department of Fish and Game, Regional Water Quality Control Board, and the Department of Toxic Substances Control. These and others will continue to be engaged in development of the project. Permits known to be required for the project are listed below. Specific programs and regulations are described in Chapter 2.

Permits or authorizations will be required from a number of agencies.

- The U.S. Army Corps of Engineers (USACE) will be required to approve dredge/fill (404 Permit), which will occur with the excavation in the stream and the installation of riprap at the culvert outfall. Other resource agencies are consulted by the USACE to establish permit requirements, such as species protection into the permit process.
- The Regional Water Quality Control Board will need to be consulted to obtain a Section 401 Clean Water Certification before the USACE can issue its permit.
- A Streambed Alteration Agreement will need to be negotiated with the California Department of Fish and Game for working in and altering the stream.
- An encroachment permit from the County will be required in order to construct the new culvert across Alamitos Road.
- Pending SCVWD Board of Directors' approval of the project's planning study, SCVWD will prepare design plans and specifications for approval by DTSC, consistent with DTSC's requirements for remedial design.

Chapter 2. Related Projects, Programs, and Regulations

This chapter describes projects, programs and regulations as they apply to the Jacques Gulch Restoration Project. District responsibilities are indicated in Table 2-1. Project review by agencies often involves more than one of the projects, programs, or regulations listed.

Table 2-1. Projects, Programs, and Regulations

Project/Program/Regulation	District Responsibility
Multiple Species Habitat Conservation Plan	Provide for project review by resource agencies
Santa Clara County General Plan	Review as part of CEQA assessment
Santa Clara County Countywide Trails and Master Plan	Provide for county review of project (Parks & Recreation Dept.)
Santa Clara Basin Watershed Management Initiative (WMI)	Project is in furtherance of WMI, no specific action required
Santa Clara Co. Urban Runoff Pollution Prevention Program	Comply with requirements for runoff management
SF RWQCB: Water Quality Control Plan	Project is in furtherance of Plan objectives – Agency review
Fisheries and Aquatic Habitat Collaborative Effort	Project is in furtherance of Effort objectives – Agency review
California Environmental Quality Act (CEQA)	Prepare appropriate CEQA environmental assessment document
Streambed Alteration Agreement Program	Obtain Agreement from Ca. Dept. of Fish and Game (CDFG)
California Endangered Species Act	If protected species present, obtain incidental take permit
California Air Quality Regulations	Comply with regulations by use of Best Management Practices
Porter-Cologne Water Quality Control Act	Project is in furtherance of RWQCB Plan required by Act
Federal Endangered Species Act	Comply with requirements to protect species. Agreement obtained as part of U.S. USACE Clean Water Act permit
Clean Water Act	Obtain permit from USUSACE; obtain concurrence from RWQCB
National Historic Preservation Act	Comply with requirements identifying and protecting cultural resources
Executive order 11990 – Protection of Wetlands	Comply with USCOE permit requirements
Migratory Bird Treaty Act	Comply with requirements of USFWS and CDFG
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	Project is in partial fulfillment of restoration required by Consent Decree arising out of CERCLA action
Resource Conservation and Recovery Act	Comply with requirements of Calif. Department of Toxic Substance Control
Encroachment on Santa Clara County Road	Obtain encroachment permit for installation of culvert

2.1 Santa Clara Valley Water District

2.1.1 Multiple Species Habitat Conservation Plan

The District in cooperation with the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), the California Department of Fish and Game (CDFG) Santa Clara County, the Cities of San Jose, Morgan Hill and Gilroy, and the Valley Transportation Authority, is preparing the Santa Clara County Habitat Conservation Plan/Natural Community Conservation Plan (HCP/NCCP). The HCP/NCCP addresses the District's and partners' activities and responsibilities under the federal Endangered Species Act (ESA) of 1973 as amended (16 USC 1531-1544). The District, in preparing this HCP/NCCP, is requesting an incidental take statement under Section 10(a) of the Act to conduct flood protection, water supply, and related activities within the District's operational area. The HCP/NCCP, when completed, will address projects, activities, and the process the District will use to evaluate the potential for take of covered species. The project site contains at least one species on the Interim Projects Species List: Loma Prieta hoita (*Hoita strobilina* CNPS List 1B). The District is required to notify Resource Agencies to request comments regarding recommended mitigation measures or project alternatives that would help achieve the conservation objectives of the pending HCP/NCCP. Conservation objectives and mitigation measures for Loma Prieta hoita will be incorporated into the project plan as they are made available.

2.2 Regional Efforts

2.2.1 Santa Clara County General Plan

The Santa Clara County General Plan was adopted in 1994. Its purpose is to provide the county with comprehensive countywide direction for growth and development from 1995 to 2010. The aims of the plan are expressed through a series of goals that can be classified under four basic themes:

- social and economic well-being;
- managed, balanced growth;
- livable communities; and
- responsible resource conservation.

Technically, the County General Plan is not legally binding for cities under County jurisdiction, many of which, including San Jose, have separate city-level general plans. However, the County General Plan encourages the voluntary support of Santa Clara County municipalities to achieve its countywide goals.

2.2.2 Santa Clara County Countywide Trails Master Plan Update

The Santa Clara County Countywide Trails Master Plan Update summarizes the County's trails-planning history and presents a master plan for a countywide trail network. The plan was developed by the Santa Clara County Trails Master Plan Advisory Committee and was adopted by the Santa Clara County Board of Supervisors on November 14, 1995. The countywide trail network proposed in the Trails Master Plan Update comprises 535 miles of off-street and creek side trails (105 miles of existing trails and 430 miles of proposed trails) and an additional 120 miles of on-street bicycle-only routes (Santa Clara County 1995). The proposed trail system traverses both public and private lands. To guide implementation of the trail system plan, the Trails Master Plan Update suggests procedures for coordinating with private landowners, establishing trail segment priorities, mitigating environmental impacts, and specifying details of trail design, operations, and management. Construction of the proposed trail system is expected to take place over several decades. Hicks and Alamitos Roads are planned as on-street bicycle routes within the road right-of-way.

2.2.3 Santa Clara Basin Watershed Management Initiative

The Santa Clara Basin Water Management Initiative (WMI) began in 1996, with a stated mission of "protecting and enhancing the watershed, [and] created a sustainable future for the community and the environment." The WMI was conceived by the Environmental Protection Agency (EPA), the State Water Resources Control Board, the District, and the San Francisco Bay Regional Water Quality Control Board (RWQCB). The WMI addresses all sources of pollution threatening San Francisco Bay in order to safeguard water quality throughout the Santa Clara Basin watershed. The central aim of the WMI is to coordinate existing regulatory activities on a basinwide scale rather than to establish separate regulatory actions for specific issues. Because of its regional scope, the WMI involves the coordination of numerous stakeholders representing a cross section of the Santa Clara Basin business, agricultural, residential, environmental, and regulatory communities.

2.2.4 Santa Clara County Urban Runoff Pollution Prevention Program

Fifteen Santa Clara County entities participate in the Santa Clara Valley Urban Runoff Pollution Prevention Program, including the City of San Jose and 12 other local municipalities, the County of Santa Clara, and the District. These agencies are co-permittees under a National Pollutant Discharge Elimination System (NPDES) stormwater permit issued by the RWQCB. As a condition of the permit, the participant agencies created an Urban Runoff Management Plan, which identifies the activities various City departments are required to undertake in order to comply with the federal and state requirements of the stormwater permit.

2.2.5 San Francisco Regional Water Quality Control Board's Water Quality Control Plan

State Water Resources Control Board (SWRCB) and RWQCB for the San Francisco Bay Region establish policies and procedures that are designed to protect surface water and groundwater from degradation. The RWQCB establishes beneficial uses of surface water and groundwater resources, along with narrative and numerical water-quality objectives to protect those uses, in its Water Quality Control Plan for the San Francisco Bay Basin (California Regional Water Quality Control Board, 1995). The RWQCB administers the NPDES permitting and Section 401 water quality certification processes.

Under the authority of Section 303(d) of the Clean Water Act (CWA), RWQCB and SWRCB list water bodies as impaired when not in compliance with designated water-quality objectives and standards. Section 303(d) also requires the preparation of a total maximum daily load (TMDL) program for waters identified by the State as impaired. A TMDL is a quantitative assessment of a problem that affects water quality. The problem can include the presence of a pollutant, such as a heavy metal or a pesticide, or a change in a physical property of the water, such as a water body and specifies an allowable load of the pollutant from individual sources to ensure compliance with water quality standards. Once the allowable load and existing source loads have been determined, reduction in allowable loads are allocated to individual sources.

2.2.6 Fisheries and Aquatic Habitat Collaborative Effort

Guadalupe River, Coyote Creek, and Stevens Creek provide habitat for a variety of aquatic resources, including fall-run Chinook salmon and steelhead. Many activities, including water management, urban encroachment, land uses, agricultural use, reclamation, flood protection, and water supply operations by the District, cause concern for the condition of the public trust resources and the quality and availability of in stream habitat in the river and creeks. These activities also raise concern about the economic and social impacts of efforts to significantly alter the existing flow regimes of the river and creeks. The District has been named in a complaint filed before the SWRCB for violations of the California Fish and Game Code, the California Water Code, and Public Trust Doctrine related to the District's incremental contribution to the cumulative impacts on Chinook salmon and steelhead and their habitat within the river and creeks. The complaint alleges harm to coldwater fisheries as a result of consumptive urban and agricultural water uses in Santa Clara County. To address this complaint, the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) has been initiated jointly by the District and DFG.

The FAHCE identifies factors limiting steelhead and Chinook salmon populations in the Guadalupe River, Coyote Creek, and Stevens Creek watersheds. Both flow and non-flow measures will be considered by the FAHCE when addressing the complaint. Participants include the District; CDFG; Guadalupe-Coyote Resource Conservation District, Pacific Coast Federation of Fishermen's Associations, and Trout Unlimited, as represented by National Heritage Institute (NHI); NMFS; USFWS; and the City of San Jose.

2.3 State Regulations

2.3.1 California Environmental Quality Act

CEQA (Public Resource Code 21000 et seq.) provides the foundation for environmental law and policy in California. The primary objectives of CEQA are:

- To disclose to decision makers and the public the significant environmental effects of proposed projects;
- To identify ways to avoid or reduce environmental damage;
- To prevent environmental damage by requiring implementation of feasible project alternatives and/or mitigation measures;
- To disclose to the public reasons for agency approval of projects with significant environmental impacts;
- To foster interagency coordination in the review of projects; and
- To enhance public participation in the planning and environmental review process.

CEQA applies to all discretionary activities proposed, implemented, or approved by California public agencies, including state, regional, county, and local agencies, unless a specific exemption applies.

CEQA requires that public agencies comply with both procedural and substantive requirements. Procedural requirements under CEQA include the preparation of appropriate environmental documents, consideration of project alternatives, development of mitigation measures and a mitigation monitoring program. CEQA also specifically provides for public involvement in the review process by requiring public notice of preparation of environmental documents, establishing a public scoping process, and requiring lead agencies to respond to public comments in final environmental documents. CEQA's substantive provisions require agencies to address environmental impacts disclosed in an appropriate document. When avoiding or minimizing environmental damage is not feasible, CEQA requires agencies to prepare a written statement of overriding considerations when they decide to approve a project that will cause one or more significant effect(s) on the environment. CEQA also establishes a series of action-forcing procedures to ensure that agencies accomplish the purposes of the law. In addition, under the direction of CEQA, the California Resources Agency has adopted regulations, known as the state CEQA Guidelines, which provide detailed procedures that agencies must follow to implement the law.

2.3.2 California Fish and Game Code, Sections 1601-1607 (Lake or Streambed Alteration Agreement Program)

Under Sections 1601-1607 of the California Fish and Game Code, the California Department of Fish and Game (DFG) regulates projects that affect the flow, channel, or banks of natural bodies of water. Project proponents are required to notify and enter into a streambed alteration agreement with DFG before beginning construction of a project that will: (1) divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake; (2) use materials from a streambed; or (3) result in the disposal or deposition of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into any river, stream, or lake. Sections 1601-1607 typically do not apply to drainages that lack a defined bed and banks, such as swales and vernal pools.

The District will submit a Section 1602 application to DFG for a Lake or Streambed Alteration agreement.

2.3.3 California Endangered Species Act

The California Endangered Species Act (CESA) protects wildlife and plants listed as threatened and endangered by the California Fish and Game Commission. It is administered by DFG. CESA requires state agencies to seek and conserve threatened and endangered species and thus restricts all persons from taking listed species except under certain circumstances; *take* is defined as any action or attempt to "hunt, pursue, catch, capture, or kill." Section 2080 of the California Fish and Game Code prohibits the take of species listed as threatened or endangered by DFG. However, under Section 2081, DFG may issue incidental take permits for species that are not designated as "fully protected." The requirements for an application for an incidental take permit are described in Section 2081 and in final adopted regulations for implementing Sections 2080 and 2081.

2.3.4 California Air Quality Regulations

State air quality regulations are the responsibility of the California Air Resources Board (CARB), an arm of the California Environmental Protection Agency (Cal-EPA). The California Clean Air Act of 1988 established California ambient air quality standards (CAAQS), which, unlike the federal NAAQS standards, represent concentrations that should never be exceeded. Under the California Clean Air Act, attainment of air quality within the state's individual "air basins" (defined on the basis of topography and air circulation patterns) is the responsibility of local Air Quality Management Districts. The Air Quality Management Districts are required to develop plans and strategies for attaining CAAQS. Santa Clara Valley, including the proposed project site, is located in the southern portion of the San Francisco Bay Area Air Basin (SFBAAB) and is under the jurisdiction of the Bay Area Air Quality Management District (BAAQMD).

2.3.5 Porter-Cologne Water Quality Control Act

Under the Porter-Cologne Water Quality Control Act of 1975, beneficial uses of California's major rivers and groundwater basins, along with narrative and numerical water quality objectives, are established and periodically reviewed in Water Quality Control Plans (basin plans) (California Regional Water Quality Control Board 1995). CWA assigns the primary responsibility for protecting surface and groundwater resources from degradation, including oversight of basin plans, to the Regional Water Quality Control Boards. Basin plans are primarily implemented by using the NPDES permitting system to regulate waste discharges.

Jacques Gulch is a tributary to Almaden Reservoir. The beneficial uses for Almaden Reservoir identified in the Basin Plan include cold freshwater habitat, groundwater recharge, municipal and domestic supply, water contact recreation, noncontact water recreation, fish spawning, warm freshwater habitat, and wildlife habitat. The project will need to meet or exceed the water quality in Jacques Gulch necessary to maintain these beneficial uses.

2.4 Federal Regulations

2.4.1 Endangered Species Act, Sections 7, 9 and 10

The U.S. Fish and Wildlife Service (USFWS) has jurisdiction over species listed as threatened or endangered under Section 9 of the Endangered Species Act (ESA). The ESA protects listed species from harm, or take. *Take* is broadly defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct."

ESA Section 7 requires federal agencies to consult with the Secretary of the Interior through the USFWS and the Secretary of Commerce through National Marine Fisheries Service (NMFS) to *ensure that agency projects do not jeopardize the continued existence of endangered or* threatened species or destroy or adversely modify critical habitat that supports such species. If a proposed project "may affect" a listed species or designated critical habitat, the lead agency must prepare a biological assessment (BA) to determine whether the effect is "adverse." If the *effect is determined to be adverse, USFWS and/or NMFS must prepare a biological opinion.* If the project does not jeopardize the continued existence of the species, USFWS may issue an incidental take permit under ESA Section 10, which requires the lead to submit a conservation plan addressing project impacts and mitigation measures.

The federally threatened steelhead (*Oncorhynchus mykiss*) may have occurred historically in this drainage, but currently the presence of the dam at Almaden Reservoir would prevent this anadromous fish from migrating from the ocean. The California red-legged frog (CRLF) (*Rana aurora draytonii*) Habitat Assessment for Jacques Gulch (WRA, 2005a) concluded that there was potential CRLF breeding habitat in the westernmost portion of Site A, where a spring provided perennial aquatic habitat, as well as Almaden Reservoir. Surveys were initiated following the Revised Guidance on Site Assessments and Field Surveys for the CRLF (USFWS, 2005) in the summer of 2005.The eight recommended survey days were completed with no red-legged frogs detected. Based on the surveys and site inspections, it is believed that Jacques Gulch is not suitable breeding habitat for CRLF due to high water flows during the winter, the presence of predatory fish, and the negative survey findings. However, the area does provide dispersal habitat for CRLF. Because the proposed project will require the issuance of a permit by the USACE, San Francisco District, under Section 404 of the Clean Water Act (CWA; see additional discussion in following paragraphs), the project is considered a federal undertaking and the Corps must comply with Section 7 of the ESA.

2.4.2 Clean Water Act

Section 303(d). Under CWA Section 303(d), the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards are required to list bodies of water as impaired when the traditional permitting processes for waste discharges have failed to maintain designated water quality objectives and standards. CWA Section 303(d) also requires preparation of a Total Maximum Daily Load (TMDL) program for waters identified by the state as impaired. A TMDL is a quantitative assessment of a problem that affects water quality. A TMDL specifies the allowable load of pollutants from individual sources to ensure compliance with water quality standards. Once the allowable load and existing source loads have been determined, reductions in allowable loads are allocated to the individual pollutant sources.

Parts of the Guadalupe River system (including Guadalupe Creek, Guadalupe Reservoir, Alamitos Creek, and Calero Reservoir) and the southern part of San Francisco Bay are considered impaired for mercury under CWA Section 303(d), meaning that they contain mercury in unacceptable concentrations. The project area is under the jurisdiction of the San Francisco Bay Regional Water Quality Control Board (RWQCB), which has prepared a draft TMDL program for mercury for San Francisco Bay. The program calls for a significant reduction in the transport of mercury to the Bay by the Guadalupe River system, and establishes a goal of reducing the concentration of mercury in sediments to less than 0.4 milligrams per kilogram (mg/kg) total mercury relative to the percentage of material less than 63 micrometers (μm) in diameter.

Section 404 and 230. Under CWA Section 404, the USACE and the U.S. Environmental Protection Agency (EPA) regulate the discharge of dredged and fill materials into waters of the

United States. *Waters of the United States* include lakes, rivers, streams and their tributaries, as well as wetlands. Wetlands are defined for regulatory purposes as areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328.3, 40 CFR 230.3). Project proponents must obtain a permit from the USACE for all discharges of dredged or fill material into waters of the United States, including wetlands, before proceeding with a proposed action. The USACE may either issue individual permits on a case-by-case basis or general permits on a program level.

Discharges to waters of the United States are further regulated under CWA Section 230. Under CWA Section 230.10(a), Section 404 and other permits may be issued only for the "least environmentally damaging" alternative. That is, a proposed discharge may not be permitted if there is a practicable alternative that would have less adverse impacts and lacks other significant adverse consequences.

For regulatory purposes, the project area is under the jurisdiction of the USACE, San Francisco District. The District will apply for a Section 404 permit for the proposed project.

Section 402. CWA Section 402 regulates construction-related stormwater discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) program, administered by the EPA. In California, the SWRCB is authorized by the EPA to oversee the NPDES program through the Regional Water Quality Control Boards.

NPDES permits are required for projects that disturb more than 5 acres of land. The NPDES permitting process requires the applicant to file a public notice of intent to discharge stormwater and to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP includes a site map and a description of proposed construction activities. In addition, it describes the best management practices (BMPs) that will be implemented to prevent soil erosion and discharge of other construction-related pollutants (e.g., petroleum products, solvents, paints, cement) that could contaminate nearby water resources. Permittees are required to conduct annual monitoring and reporting to ensure that BMPs are correctly implemented and effective in controlling the discharge of stormwater-related pollutants.

The Project encompasses an area of approximately 4 acres, not including the consolidation site. If the District decides to implement a SWPPP for the Project, the contractor selected by the District to construct the Project will be required to prepare and implement the SWPPP and monitoring program.

Section 401. Under CWA Section 401, applicants for a federal license or permit to conduct activities that may result in a discharge of a pollutant into waters of the United States must obtain certification from the state in which the discharge would originate, or, if appropriate, from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all projects that have a federal component and may affect state water quality (including projects that require federal agency approval, such as issuance of a Section 404 permit) must also comply with CWA Section 401.

The District will submit a written request to the RWQCB for water quality certification, to comply with CWA Section 401.

2.4.3 National Historic Preservation Act, Section 106

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, requires federal agencies or agencies for which they provide funding or issue permits to take into account the effects of their actions on cultural resources listed in, or eligible for listing in, the National Register of Historic Places (NRHP) and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on these actions.

The section 106 compliance process has four basic steps:

(1) Identify and evaluate historic properties.

(2) Assess effects of the project on historic properties.

(3) Consult with the State Historic Preservation Officer (SHPO) and other interested parties regarding adverse effects on historic properties, resulting in a memorandum of agreement (MOA).

(4) Proceed in accordance with the MOA.

The proposed project will require the issuance of a permit by the USACE, San Francisco District under Section 404 of the CWA; therefore, the project is considered a federal undertaking. As a result, the Corps must comply with Section 106 of NHPA. SHPO will be consulted to determine if historic properties may be affected by implementation of the proposed project.

2.4.4 Executive Order 11990, Protection of Wetlands

Executive Order 11990 (May 24, 1977) directs all federal agencies to refrain from assisting or giving financial support to projects that encroach on public or privately owned wetlands.

2.4.5 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) (16 USC 703) enacts the provisions of treaties between the United States, Great Britain, Mexico, Japan, and the Soviet Union and authorizes the U.S. Secretary of the Interior to protect and regulate the taking of migratory birds. The MBTA is administered by the USFWS, and sets seasons and bag limits for hunted species and protects migratory birds, their occupied nests, and their eggs (16 USC 703, 50 CFR 21, 50 CFR 10).

It is a strict-liability law that incorporates no requirement to prove intent to violate any of its provisions. Wording in the MBTA makes it clear that most actions that result in "taking" or possession (permanent or temporary) of a protected species can be a violation of the Act. The word *take* is defined as meaning "pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 CFR 10 12). The provisions of the MBTA are nearly absolute; "except as permitted by regulations" is the only exception. Examples of permitted actions that do not violate the law are the possession of a hunting license to pursue specific game birds, legitimate research activities, display in zoological gardens, bird-banding, and similar activities (Faanes et al. 1992).

Since raptors and other birds may potentially nest within the trees and shrubs that occur in and adjacent to the Study Area, there is a potential for construction-related impacts to nesting birds. Disturbance that results in the abandonment of an active nest is considered a significant impact. It is recommended that breeding season bird surveys be conducted prior to initial ground disturbance. If an active nest is observed, an exclusion buffer of 100 to 500 feet (depending on the species and location) around the nest is recommended.

2.4.6 Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also known as the Superfund Act) of 1980 (PL96-510) is administered by the EPA. It is intended to protect the public and the environment from the effects of prior hazardous waste disposal and new hazardous material spills. CERCLA provides funds to compensate victims and to decontaminate the environment. The Superfund Amendments and Reauthorization Act (SARA) of 1986 (PL-99-499) amends some provisions of CERCLA and provides for a Community Right-to-Know program.

2.4.7 Resource Conservation and Recovery Act

The EPA also administers the Resource Conservation and Recovery Act (RCRA) of 1976 (PL 94-580), along with the Hazardous and Solid Waste Amendments (HSWA) of 1984. This legislation provides the principal regulation for the storage, transportation, and disposal of both solid and hazardous waste. RCRA imposes reporting and permitting requirements, and provides for operational control on those who generate, treat, store, transport, or dispose of hazardous waste.

Chapter 3. Project Area Background

3.1 Geomorphology, Hydrology, Hydraulics

3.1.1 Geomorphology

Physiography

Jacques Gulch is a tributary to Almaden Reservoir on Alamitos Creek, originating in the steep hills of the Los Capitancillos Ridge, flanked by Santa Teresa Hills and Sierra Azul (Figure 3-1). It flows southeast for approximately 2 miles before draining into Almaden Reservoir. Alamitos Creek is part of the Guadalupe River watershed. Bald Mountain, at 2,387 feet, is the highest point in the Jacques Gulch watershed. The elevations range from approximately 2,400 feet to 500 feet. The creek drains an area of approximately 909 acres (1.42 mi square miles). The watershed is steep, largely undeveloped, with a large amount of land part of Almaden Quicksilver County Park. The land cover in the watershed is predominantly chaparral interspersed with valley oak woodland system.

Geology

Jacques Gulch drains part of the Los Capitancillos Ridge, which lies in the eastern Santa Cruz Mountains. The Santa Cruz Mountains, a subset of the Coast Range, extend from South San Francisco to Santa Cruz. The bedrock in the Jacques Gulch watershed is mainly composed of Mesozoic meta-sedimentary and volcanic rocks with an area of Tertiary sandstones, siltstones, and mudstones in the northern end of the watershed (Figure 3-2). The tertiary rocks in the watershed are highly erodible. The project sites are located four miles from the San Andreas Fault Rift Zone.

Rocks in the watershed are susceptible to mass wasting processes, such as landslides, rock-falls, and debris flows. Mass wasting is normally triggered by large storm or seismic events. The U.S. Geological Survey mapped the distribution of landslides evident in the landscape in the Santa Clara County (Wentworth et al., 1997). The map of historic and recent landslides is instrumental in predicting the future movements of such mass wasting events since future landslides are most likely to occur within the delineated parts of the landscape where these landslides have previously occurred. Although in general Jacques Gulch watershed has a low susceptibility to landslides and earth flows there are several landslide areas in the headwaters and within the project area, both Sites A and B are susceptible to landslides (Figure 3-3).

Soils

The soils in the watershed are composed of Arbuckle-Pleasanton association overlaying mostly the eastern side of the creek and Sunnyvale-Castro-Clear Lake series west of the creek (Figure 3-4). The project sites are both located in the Arbuckle-Pleasanton series.

The Arbuckle-Pleasanton association consists of well- to excessively drained, medium textured, gravelly soils, developed in gravelly alluvium. Arbuckle soils make up about 60 percent and Pleasanton soils 25 percent of this association. The texture of these soils is gravelly loam and gravelly clay loam. The Sunnyvale–Castro–Clear Lake association consists of poorly drained soils, developed in mottled alluvium. Sunnyvale soils make up about 40 percent of this association; Castro soils 25 percent and Clear Lake soils 20 percent. This association consists of poorly drained, fine textured silty clay and clay soils.

Erosion and Sediment Yield

The combination of active tectonics, rugged relief, and erodible rocks means that the Jacques Gulch watershed generates large amounts of sediment. An initial study, performed by Tetra Tech, used the Revised Universal Soil Loss Equation and was adapted to estimate annual sediment yield at the two sites. A factor was added to incorporate channel erosion and estimated the annual sediment yield as 440 cubic yards at Site A and 72 cubic yards at Site B. The Santa Clara Valley Watershed Stewardship Initiative identified the Jacques Gulch watershed as having one of the highest erosion susceptibilities for any watershed between the Guadalupe River and San Francisquito Creek. The steep relief and small watershed area means that sediment will tend to be generated in episodic pulses from landslides and erosion that exceed the transport capacity of the channel system and are temporarily stored in less hydraulically efficient channel reaches until the sediment can be reworked and delivered downstream in successive rainfall events.

Geomorphic Conditions Assessment

A geomorphic assessment was conducted to determine existing conditions and to identify an appropriate geomorphic channel design for the Project. The existing conditions assessment focused on identifying erosion features that could threaten the stability of the restored creek or that could be sources of excess sediment, and on identifying potential reference reaches to form a basis for design. Because much of the restoration design relates to past and present sediment transport processes, the channel is described from upstream to downstream. However, the reach and site identifiers follow convention and proceed from downstream to upstream (i.e., Reach A1 to Reach B4).

The unnamed tributary of Jacques Gulch (hereafter referred to as Mine Hill creek) enters the upper end of Site B as a steep, confined, boulder and cobble step-pool channel with no floodplain. It is erosive to transportational, with outside bends eroding the surrounding hillslopes and causing small mass failures. The channel likely receives and transports periodic debris flows from the surrounding hillslopes. The landslide map (Figure 3-3) shows the susceptibility of the surrounding hillslopes to landslides; the calcine entered the site through what was effectively a man-made debris flow from Mine Hill. Within the project area the upper reach, Reach B4, has an average gradient of 6.2% between the top of Site B (chainage 29+75 feet) and a location 100 feet downstream of where a tributary joins the channel from the north (chainage 24+00 feet). The channel in Reach B4 has a cobble and boulder step-pool form, with some less confined reaches where the geotechnical report revealed the presence of small floodplain areas that are now buried in calcine. Current conditions and the geotechnical investigation show that calcine was deposited in the less confined reaches to depths between 6 and 9 feet, and that the channel subsequently eroded through the deposits to approximately regain its original thalweg elevation, but not its original width. In some locations the channel has not completely eroded through the calcine in the bed, forming several knickpoints in the more resistant cohesive materials. There are also several small knickpoints in the natural channel material, and what appears to be a failing constructed step-pool at the upstream project boundary. Erosion in this reach is increased by the greatly confined channel geometry compared to pre-calcine conditions. The calcine deposits are exposed in the channel sides as vertical banks, maintained due to the cohesive nature of the material. The deposits are being eroded as cantilever slab failures where the channel undercuts the calcine and erodes the less resistant native materials underneath. Failed blocks have fallen into Mine Hill Creek and are being subsequently broken down into smaller pieces of calcine that are then transported downstream and redeposited in the lower portion of Site B and the upper portion of Site A. Within the upper reach there are two outside bends where the channel is eroding the base of the hillslope, causing small landslides and contributing additional (non-calcine-

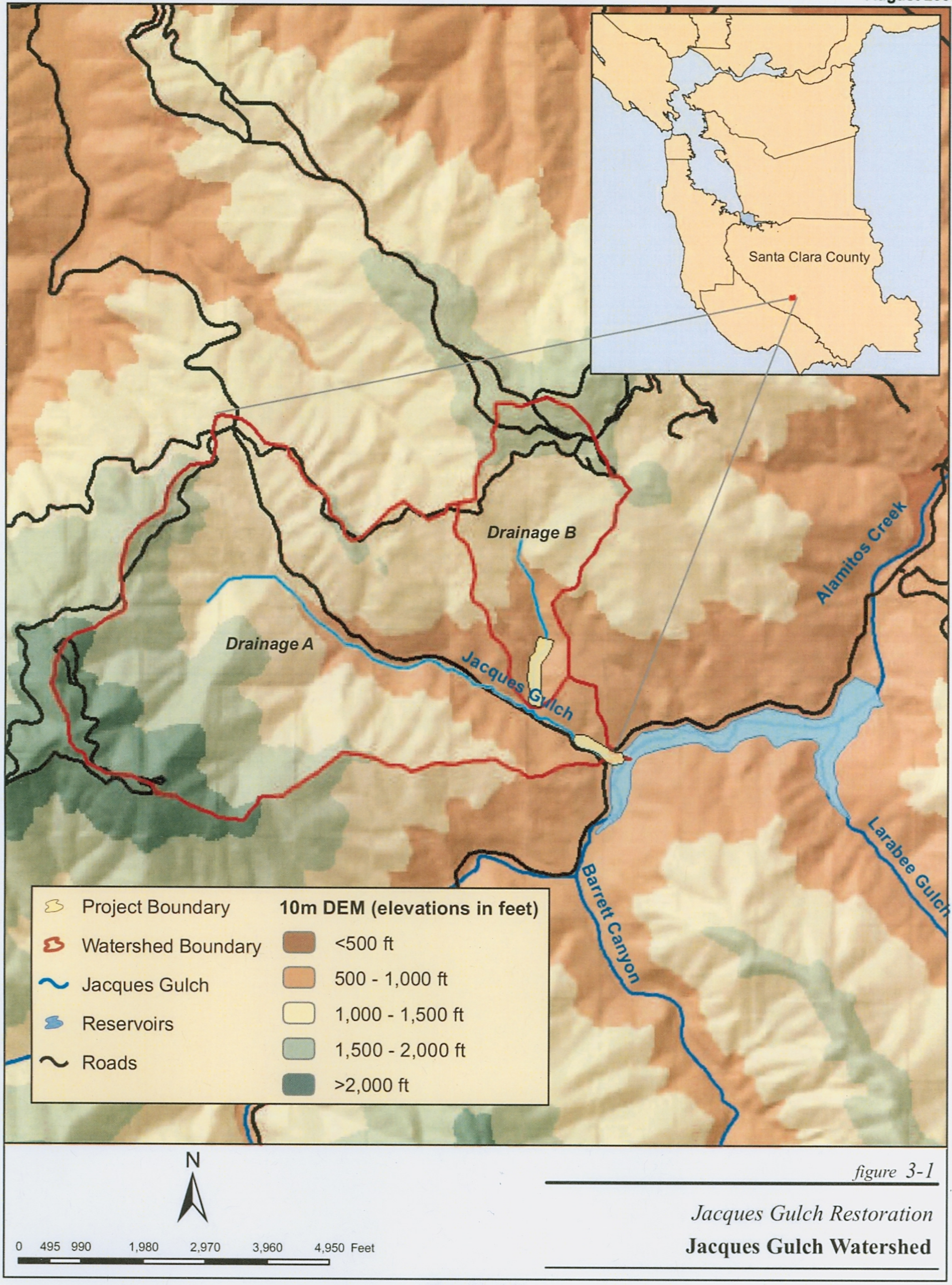


figure 3-1

Jacques Gulch Restoration

Jacques Gulch Watershed

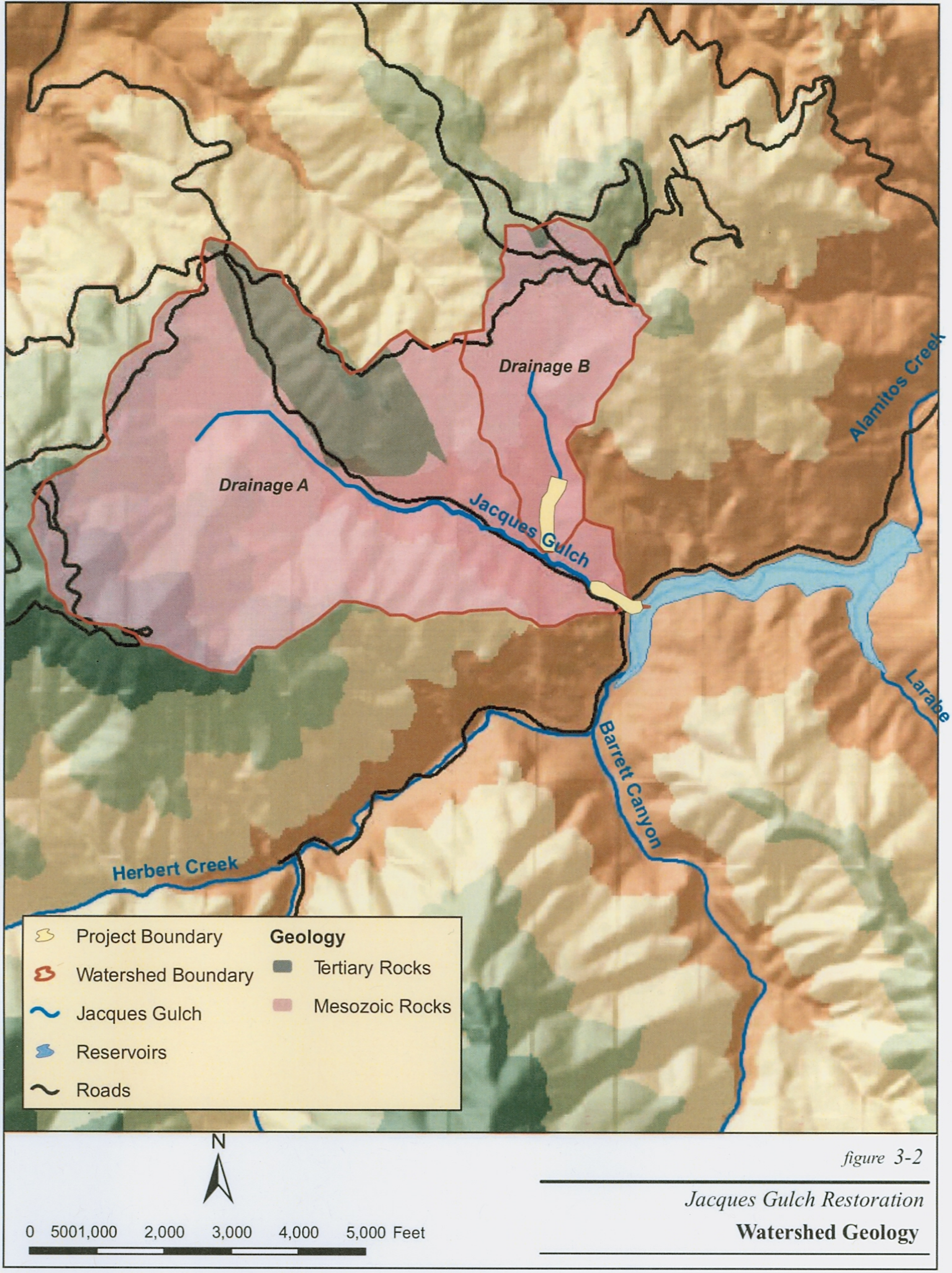


figure 3-2

Jacques Gulch Restoration

Watershed Geology

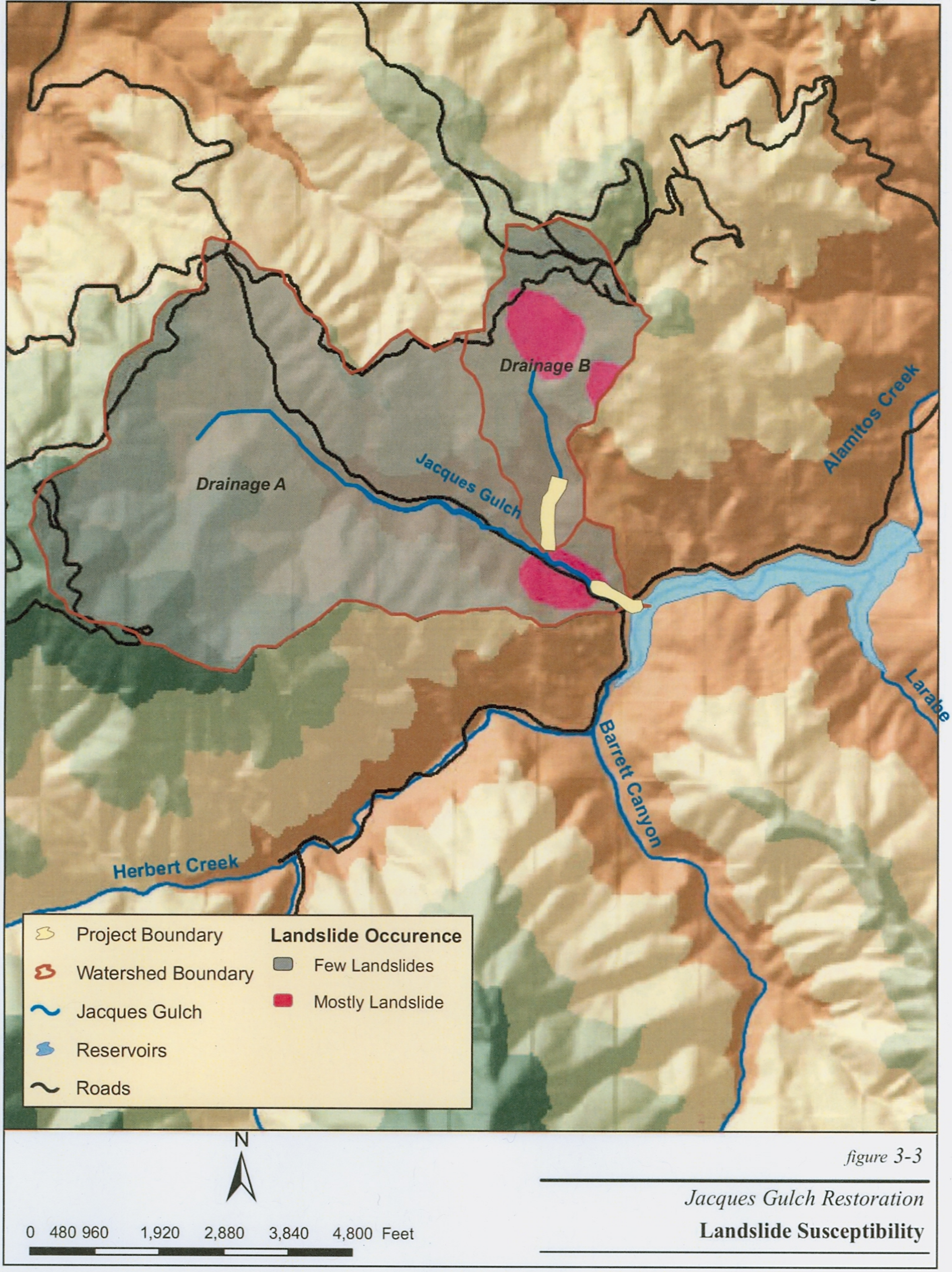


figure 3-3

Jacques Gulch Restoration

Landslide Susceptibility

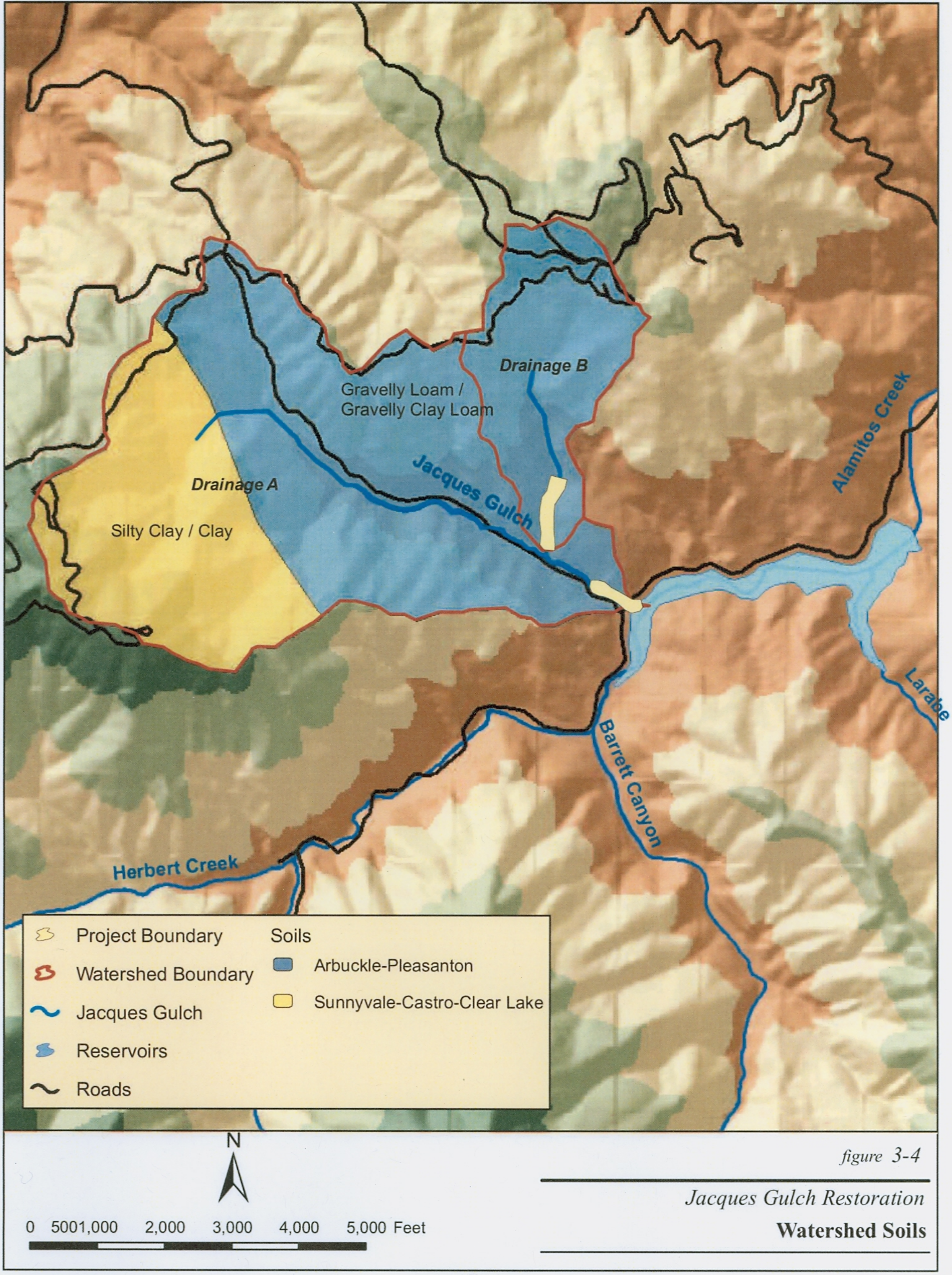


figure 3-4

Jacques Gulch Restoration

Watershed Soils

bearing) sediment. While to a certain extent this is a natural process in headwater creeks such as this one, erosion may be accelerated by the calcine, which has occupied part of the channel cross section, thereby confining flow and increasing channel erosive stresses.

In Reach B3 (24+00 to 22+05 feet) the channel gradient drops to 3.2% 100 feet downstream of the tributary but in other respects, the next 195 feet of channel remains similar to the upstream reach, with calcine deposits that are 6 to 9 feet deep and that form eroding vertical channel walls that confine the channel compared with pre-calcine conditions.

At 22+05 feet, the channel changes form and becomes much less confined through Reach B2, with a clearly defined floodplain that is approximately 400 feet long and 60 feet wide. It maintains a gradient of 3.2%. The channel between 22+05 and 17+10 feet has a poorly developed riffle-pool form with a gravel and sand bed. It appears to have been largely depositional in the past, but the confining presence of cemented calcine has created a more incised channel that has triggered erosion. Exposures in the channel wall and the geotechnical report show the floodplain to be covered in approximately 4 feet of calcine deposits (becoming thinner downstream), but to have a flat base in native sediment, indicating that a floodplain existed prior to the calcine deposition. On the left bank, the channel has migrated into the hillslope, triggering a small landslide. This leftward migration may be natural, but may have been accelerated by deposition of the calcine on the right bank floodplain and the associated confinement and increase in erosion potential. The channel is somewhat incised in most of this reach due to the resistant calcine channel walls, but erosion in this reach is less severe than upstream as the calcine has spread out over a wider area and formed shallower deposits. The channel appears to have incised back through the calcine so that it is resting on its original bed in most places. Towards the downstream end of Reach B2, there is a short sub-reach that appears to be relatively stable, and that was surveyed as a potential reference reach (see below).

The start of the lowest reach on Site B (Reach B1, from 17+10 to the downstream boundary at 15+50 feet) is marked by a large knickpoint or headcut of approximately 4 feet, partially stabilized by the roots of an oak tree. Downstream of the knickpoint, the channel is much more incised, with vertical banks in native sediment. The channel has a gradient of 4.2% and appears to have over-excavated its bed in this location, due perhaps to its relatively confined condition upstream. The incision has created a high, over steepened bank on the right channel bank. Examination of the channel thalweg profile suggests that if the headcut is not stabilized, it is likely to migrate upstream for a distance of approximately 200 feet before intercepting the existing channel grade. Such headward migration, if allowed to take place, would potentially threaten the stability of any restoration effort and trigger further bank erosion.

At the downstream end of Site B, the channel joins the Jacques Gulch main stem. Although not in the project reach, Jacques Gulch has some erosion features in this reach that have the potential to affect the proposed restoration of Site B. In particular, there is a large vertical eroding outside bend that is migrating towards the Mine Hill creek channel close to the large headcut described above. It is possible that over time, this bank migration could undercut any bank stabilization work carried out to stabilize or restore Reach B1, and stabilization of this bank is desirable as part of the restoration project.

Between Sites B and A, the channel has a mixture of gravel bedded riffle-pool form upstream, transitioning to boulder step-pool form downstream. The channel is confined with no floodplain downstream of the Mine Hill creek confluence. This reach is a mixture of erosional (due to undercutting of the steep valley sides below Hicks Road) and transportational, with no apparent deposition of calcine that passed through from Mine Hill creek.

Site A has a more homogeneous character than Site B and has been broken down into two geomorphic reaches. As Jacques Gulch enters the upstream end of Site A (Reach A2, from 9+10 to 6+60 feet), the valley becomes less confined and the channel less steep, with an average gradient of 1.7% and a slightly sinuous plane bed form. At the upper end of Site A, the channel has deposited a large volume of calcine on the former valley floor in what appears to be an old meander west of the current channel. The geotechnical report shows 9 feet of calcine in this location, in what is assumed to be a former pool at the meander apex that filled during one of the calcine deposition events, causing the channel to avulse into its current position. This area includes a berm that may be associated with the deposition event (debris flows often form natural levees) or that may have a human origin. The berm confines the channel, leading to erosion of the banks and reworking of the calcine. The bed in the upstream reach of Site A (down to approximately 6+60 feet) is resting on calcine deposits, forming erosion grooves in the resistant cohesive material. The cohesive nature of the bed appears to prevent percolation (as commonly occurs elsewhere in the bed of Jacques Gulch) creating a perched water table during the summer and fall when the remaining creek bed is dry. The upper reach becomes progressively more connected to the floodplain and less incised with distance downstream as the calcine deposits thin out (250-300 feet downstream of Site A's upper boundary).

Downstream of the calcine bed section in Reach A1 (which runs from 6+60 to 2+40 feet), the channel has incised through any calcine that may have been present in the bed and is resting on natural material that is primarily sand with some gravel. In these natural materials, the channel has formed a sinuous riffle-pool form with an average gradient of 1.7%. The channel has a floodplain and is not very confined. The most downstream 300 feet of channel above the culvert inlet appear to be influenced by backwater effects from the Alamitos Road embankment and culvert, which form a flow constriction. The channel appears to have aggraded, depositing sand, and become laterally unstable. This lateral instability is manifested in two features; a secondary channel to the east of the main channel, and bank erosion that has undercut the edge of Hicks Road where it intersects Alamitos Road. The downstream reach is well connected to its floodplain. There are several small gully heads where drainages empty to the Jacques Gulch floodplain from the surrounding hillslopes. These may require stabilization to prevent headward erosion that would add sediment to the floodplain from the surrounding hills.

Table 3-1. Topographic Properties of Project Site Reaches (Upstream to Downstream)

Reach Identifier	Chainage at Upstream Boundary* (feet)	Chainage at Downstream Boundary (feet)	Gradient (percent)	Existing Sinuosity
Reach B4	29+75	24+00	6.2	1.17
Reach B3	24+00	22+05	3.3	1.11
Reach B2	22+05	17+10	3.3	1.08
Reach B1	17+10	15+50	4.2	1.11
Reach A2	9+10	6+60	1.7	1.07
Reach A1	6+60	2+40	1.7	1.10

* Chainage stations were measured during geomorphic reconnaissance and are approximately the same as construction alignment stations.

All six project reaches have similar sinuosities, varying from 1.07 to 1.17. These low sinuosities are typical for relatively steep gradient streams. Table 3-1 provides a summary of properties for each reach.

A potential reference reach in Site A was identified and surveyed. It is described below. The reach had a gradient typical of Site A, was not confined by calcine, and did not appear to be strongly affected by the culvert backwater effects.

Developing Appropriate Channel Dimensions and Planforms for Restoration

The removal of calcine from the site will likely involve the excavation of the channel banks and parts of the bed. The existing channel is in many cases inappropriate as a restoration channel as it has formed in response to the cohesive calcine rather than the native non-cohesive sediments that the site normally supplies. As a result, a new channel cross section, slope, and planform that will be geomorphically appropriate under the post-calcine sediment transport regime needed to be developed. In most restoration projects, the goal is to create a "stable" channel, meaning one that has no net erosion or deposition over time. The assumption in these cases is that the upstream supply reach is in equilibrium or transport-limited, and that the downstream restoration reach should be in equilibrium with its supply reach to maintain sediment continuity. However, in this project area, such conditions are unlikely to have applied in the past, and this goal may not be appropriate to restoring natural function. Steep headwater step-pool channels, such as the supply reach upstream of Site B, tend to alternate between being supply-limited and erosional most of the time and receive occasional, large sediment pulses from bank failures and debris flows after which they become transport-limited until the sediment pulses have been reworked and transported downstream. Both project sites are depositional reaches located downstream of erosion and transport dominated reaches. Designing them to be stable would require making them more efficient at passing sediment downstream than they have been historically. This would be both inappropriate for natural function and would create management challenges including accelerated sediment delivery to Almaden Reservoir. A goal is thus to create a channel that is in dynamic equilibrium with the long-term depositional processes operating at each project site rather than one which is "stable" in the conventional sense of the word.

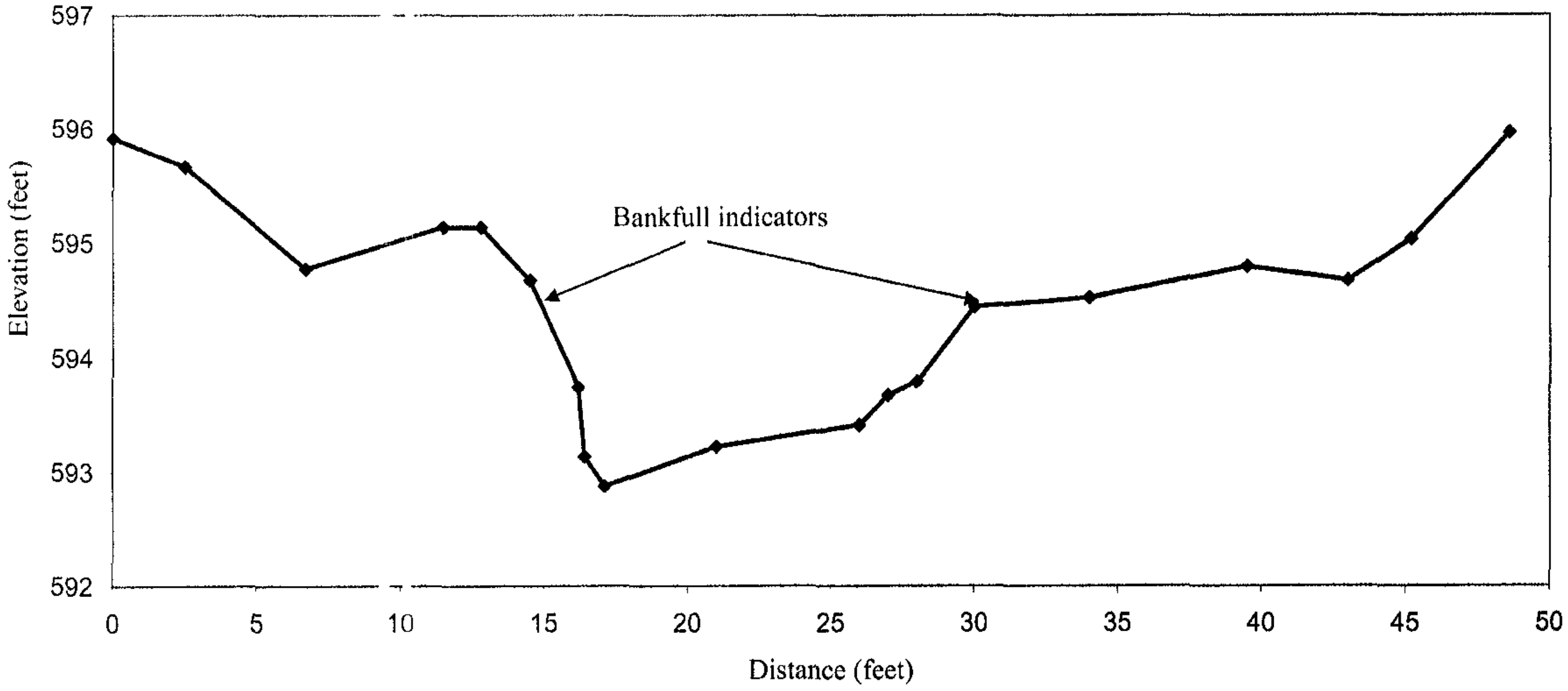
There are numerous methods of estimating appropriately dimensioned channel forms, ranging from the use of reference reaches through empirical relationships and morphological classification systems to sediment transport modeling. Typically, each method produces a different suite of potential stable dimensions, and it is generally considered prudent to use several methods and adopt either average dimensions or dimensions that are reached through more than one approach. This project used three methods: reference reaches, empirical relationships for Bay Area streams, and simple hydraulic modeling.

Reference Reaches

Two reference reaches were identified in Sites A and B that are believed to be in equilibrium with flows and to be formed in alluvial materials of the type that will form the channel cross section after restoration. Because they are not formed in calcine or under confined conditions, these cross sections should have been able to adjust to recent flow and sediment inputs in the same way that one would expect the restored site to after the calcine has been removed. Cross sections were surveyed and bankfull indicators located. Bankfull discharge is defined by Dunne and Leopold (1978) as: "The bankfull stage corresponds to the discharge at which channel maintenance is the most effective, that is, the discharge at which moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing work results in the average morphologic characteristics of channels." The bankfull indicators were scour lines, the edge of vegetation, and trash lines. Measurements of width and depth were made relative to bankfull, and are shown in Table 3-2. The reference reach cross sections are shown in Figures 3-5 and 3-6.

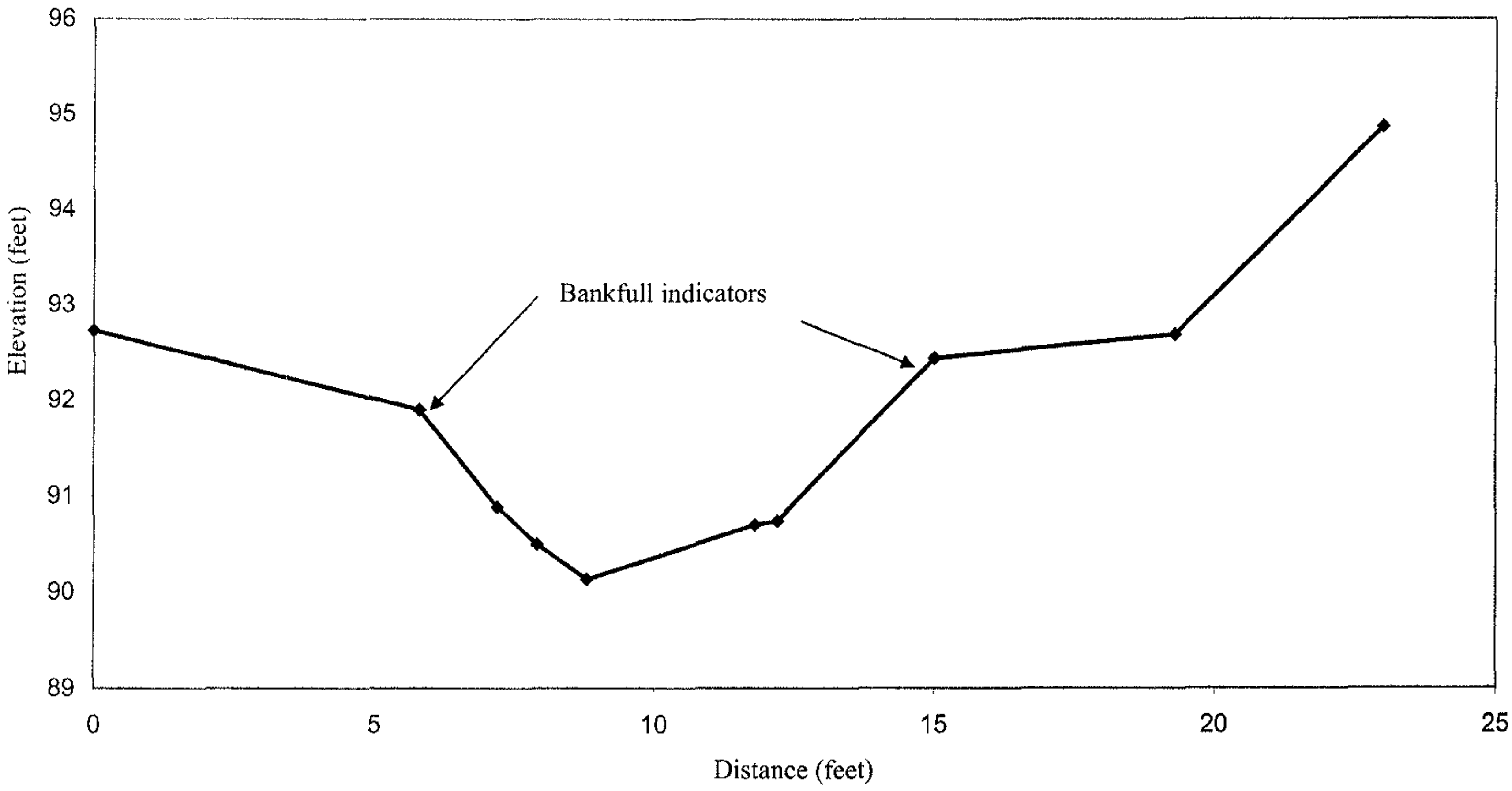
Table 3-2. Reference Reach Channel Dimensions (This Study)

	Drainage Area (sq.mi.)	Cross Section Area (sq.ft.)	Width (feet)	Depth (feet)
Site A	1.42	15.5	15.0	1.6
Site B	0.29	9.4	8.4	1.8



Notes:
Bankfull channel is 1.6 feet deep by 15 feet wide
Manning's n = 0.035 (estimated)
slope = 1.7%

Figure 3-5
Site A Reference Reach Cross Section



Notes:
Alluvial
Manning's n = 0.03 (estimated)
slope = 3.7%

Figure 3-6
Site B Reference Reach Cross Section

Regional Regression Approach

An additional estimate of equilibrium channel dimensions was made using regional regression curves developed by Dunne and Leopold (1978). Dunne and Leopold's curves are empirical relationships between observed channel dimensions and watershed areas for parts of the San Francisco Bay with mean annual rainfall of approximately 30 inches. The regional regression is an average value from several observed watersheds, with considerable variance around that trend line. The predicted dimensions for Sites A and B are shown in Table 3-3.

Table 3-3. Predicted Stable Channel Dimensions from Regional Regression (Dunne and Leopold 1978)

	Drainage Area (sq.mi.)	Cross Section Area (sq.ft.)	Width (feet)	Depth (feet)
Site A	1.42	29.7	17.7	1.7
Site B	0.29	10.7	9.4	1.2

Hydraulic Conveyance Modeling of Dominant Discharge

A third approach to channel sizing was made using a simple hydraulic model to assess the conveyance of the proposed cross section relative to "channel forming" discharge. Simplified trapezoidal channel sections were used to assess conveyance using Manning's equation. Existing channel slope and cross sections similar to those found in the reference reaches were used as a starting condition, and were iteratively varied until channel dimensions were reached that conveyed the estimated two-year flow. This approach is based on the geomorphic principle of "dominant" or "channel-forming" discharge. The concept of dominant discharge is based on the observation that over a long period of time (decades), most sediment is moved by events that occur approximately once every 1-2 years, except in landslide areas. In most stream channels, the majority of flows are small, and do not exceed the particle entrainment threshold. As flows exceed this threshold, exponentially more sediment is eroded and transported, but these events become less frequent and thus cumulatively do less work. Thus, most sediment is moved by flows above the entrainment threshold that occur moderately frequently, and that carry moderately large amounts of sediment. The effectiveness of flows was calculated by determining the flow frequency curve and combining this with a sediment rating curve (flow vs. sediment load). Studies of the dominant discharge in different environments have frequently found it to coincide with flows around the 2-year recurrence interval, though ranges from 1.0 to 2.5 years are very common and wider ranges have been found in some environments. Research on three creeks draining into the San Francisco Bay (PWA 2005) has found a dominant discharge of 2 years (plus or minus 0.5 years). Therefore, a 2-year recurrence interval flow to assess channel conveyance was adopted. For Site A, this is 78 cfs, while for Site B, it is 14 cfs (based on event-based methods performed by the District) Predicted bankfull channel dimensions are provided in Table 3-4.

Table 3-4. Predicted Bankfull Channel Dimensions from Hydraulic Conveyance Calculations[1]

	Slope (percent)	Manning's *n*	2-Year Discharge (cfs)[2]	Width at Base (feet)	Width at Bankfull (feet)	Depth at Bankfull (feet)	Area at Bankfull (sq.ft.)
Site A straight	1.7	0.035	78	9	12	1.25	12.8
Site A meander	1.7	0.035	78	4	15	1.5	13.9
Site B straight	3.7	0.035	15	5	6	0.5	2.8
Site B meander	3.7	0.035	15	3	7.6	0.6	3 5

[1] Calculations were not performed for the upper, boulder-controlled reaches of Site B since this site is assumed to be bedrock controlled following calcine removal.

[2] Bank full flow.

Selection of Channel Dimensions for the Conceptual Design

There is a relatively close agreement between the dimensions of the reference reaches and the dimensions predicted by the empirical relationships for Bay Area streams, while the simple hydraulic calculations predict smaller dimensions. This is in part due to the fact that the hydraulic calculations use a simplified cross section; the cross section areas for all three methods are very similar except for Site B, where the hydraulic calculations still produce much smaller dimensions. It should be noted that the hydrologic conditions for the site are an estimate that has not been calibrated for smaller events such as the 2-year flow. For the conceptual design, channel dimensions were based on reference reaches (Table 3-2), but additional hydraulic analysis will be performed on the preferred alternative using HEC-RAS to refine the channel design prior to development of the final design drawings. See Appendix B for HEC-RAS model information.

3.1.2 Hydrology

The Jacques Gulch restoration Sites A and B lie within the 1.42-square-mile Jacques Gulch watershed which outlets to Almaden Reservoir (Tetra Tech, 2003; Clearwater Hydrology, 2006). Site A is located on the main stem Jacques Gulch channel and extends immediately upstream of the Alamitos Road culvert, which discharges directly to the reservoir. Site B is located toward the lower end of an ephemeral tributary to Jacques Gulch that joins the main stem channel approximately 600 feet upstream of Site A. The Site B subwatershed encompasses an area of 0.29 square miles (*ibid.*). Figure 3-7 depicts the delineated project watersheds. The subject watersheds comprise steep, narrow canyons that drain to moderately to steeply (2 to >10+ percent) sloping creek channels. Canyon hillslopes are typically vegetated with grasses and varying densities of woodland, primarily oak and sycamore. Soil depths on the canyon sides and the narrow valley floors are relatively shallow, and bedrock outcrops are common both on the hillslopes and in the channel beds.

The steep nature of the canyons and their channels, the high degree of channel confinement, the shallow soils, and the frequent bedrock outcroppings contribute to a rapid runoff production in the site watersheds. This rapid runoff and the more pronounced confinement of the tributary canyon (Site B) limits the opportunity for groundwater recharge and thus restricts groundwater inflow to the channel, outside of periods of runoff-producing rainfall and immediately thereafter. The main stem Jacques Gulch channel drains a larger watershed, and the adjoining valley floor is less confined than that of the tributary channel. Thus, the valley alluvium is thick enough to support some groundwater storage and intermittent (i.e., seasonal) flow in the main stem channel.

Mean annual rainfall in the Jacques Gulch Watershed totals approximately 34 inches (CA. Dept. of Water Resources 1981). Aside from rare summer thunderstorms, the bulk of the rainfall in this Mediterranean climatic zone occurs during the wet season, which typically extends from November through March. Significant flooding events in the project area occur in response to prolonged rainstorms of 3-5 days' duration with nested cloudbursts producing intense short-duration rainfall. Since development is sparse within the watershed, flood damage is normally restricted to erosion of roadway embankments. When significant floodflows do occur, erosive energies are high and substantial sediment can be transported downstream to the lower end of the canyon (Site A) and Almaden Reservoir. Occasional debris flows can exacerbate these conditions.

Peak flow rates were computed for the Site A and Site B restoration channel reaches to facilitate the modeling of floodflow characteristics and their impact on equilibrium channel design, downstream culvert hydraulics (Site A), and channel stabilization measures. Three recurrence interval rainstorms were selected for analysis: the 2-yr., 10-yr., and 20-yr. storm events. The 2-yr. storm was used to approximate the bankfull discharge, which is the dominant channel-forming discharge. The 10-yr. and 20-yr. events were modeled to gage the effect of more infrequent severe floodflows on the restoration channels, while the 20-yr. event was modeled for purposes of evaluating culvert designs for the Alamitos Road crossing into Almaden Reservoir, at the downstream end of Site A.

Three computational methods were used to compute peak flow rates for the selected rainstorms: the HEC-1 Flood Hydrograph program (USACE Ver. 4.0; 1990), the Log Pearson Type-III flood frequency method, and the District's regional regression equations. HEC-1 uses regional rainfall distributions, infiltration/loss subroutines, and component rainfall-runoff programs to generate flood hydrographs for the modeled design rainstorm. Floodflows are then typically routed down the watershed channels to the basin outlet using a computational routing method. For the Site A and Site B Watersheds, a historical rainstorm (circa 1960s), developed by the USACE for the standard project general storm for coastal northern California, was used as the hypothetical rainfall distribution to simulate storm rainfall for the selected recurrence interval rainstorms. The chosen rainfall distribution allocated the total storm rainfall over a 24-hr. period. The total point rainfall depth used for the selected storm events was obtained from the District's regional regression equations for rainfall. These rainfall estimates were verified using recorded rainfall records from nearby rain gages.

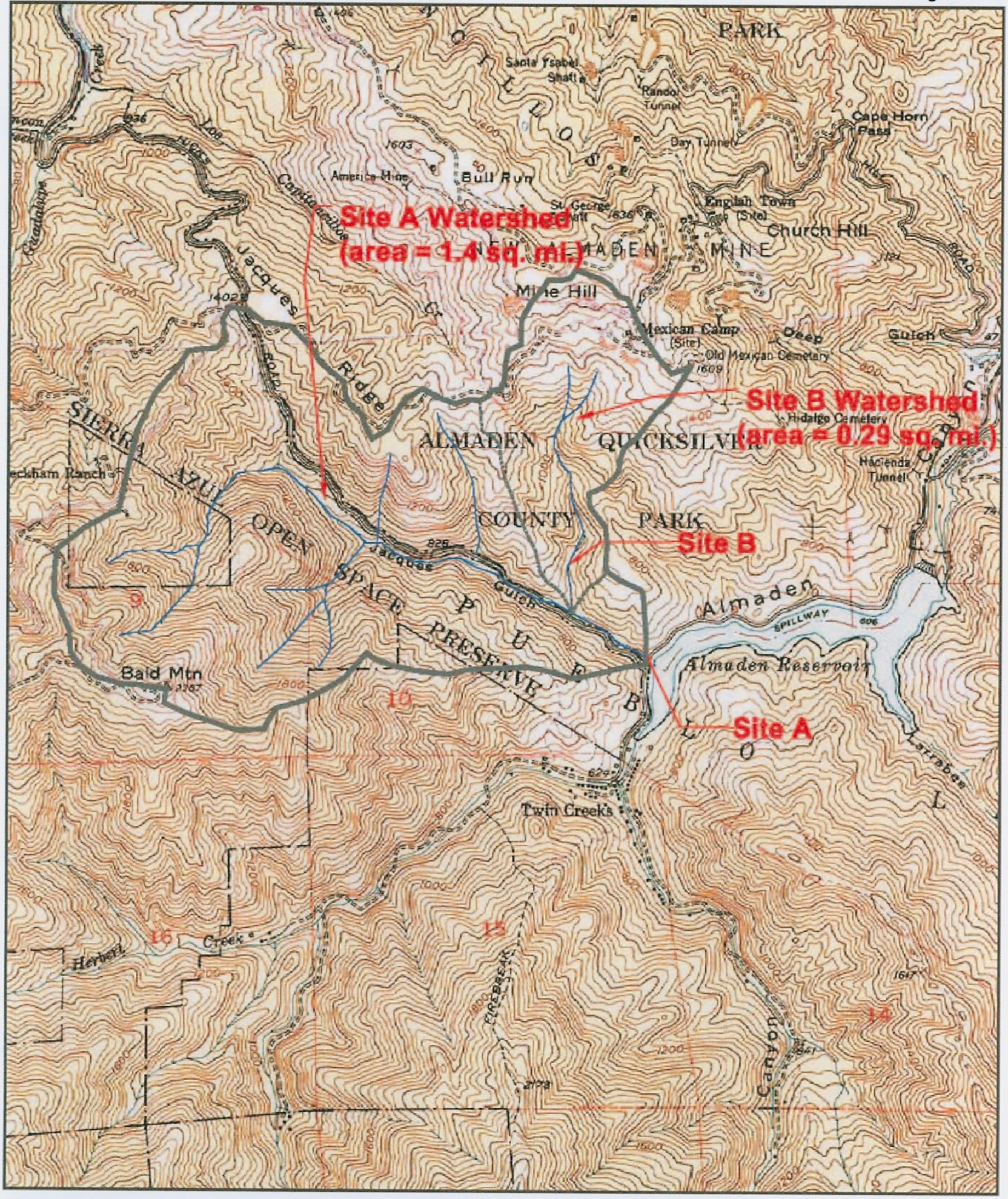
The design storm hydrograph was generated using the Clark Unit Hydrograph method, one of the optional rainfall-runoff models available in HEC-1. No channel routing routines were used to translate watershed flows downstream in the Jacques Gulch system due to the close proximity of the Site A and Site B restoration reaches.

Verification of the peak flow rates derived from HEC-1 was accomplished using two alternative peak flow estimation methods: the Log Pearson Type III (LPIII) flood frequency method and the District's regional regression equations, both of which are statistical representations of recorded stream gage data; in the present case, historical streamflow data in the Alamitos Creek watershed. These two alternative methods were used to calibrate the parameters in the HEC-1 model to better simulate observed rates of runoff production in the larger watershed. For the 20-yr. peak discharge, the LPIII estimate was used in the modeling. Figure 3-8 depicts a Gumbel arithmetic probability plot for the HEC-1-derived annual peak flows (e.g., 2-yr., 5-yr., 10-yr., 25-yr., and 100-yr. flows) for Sites A and B, as well as the LPIII-derived estimate for the 20-yr. event. The position of the 20-yr. plotting point relative to the fitted flood frequency curve indicates that this estimate was in close correspondence with the HEC-1 discharge data.

Table 3-5. Jacques Gulch Main Stem (Site A) and Tributary (Site B) Peak Discharges for Selected Recurrence Interval Rainstorms

Recurrence Interval	Peak Discharges, cfs	
	Site A	Site B
2-year	78	15
10-year	277	15
20-year	373	—

Table 3-5 lists the peak discharges estimated by the calibrated HEC-1 model or the log Pearson Type III flood frequency method (20-yr. event only) for Jacques Gulch Sites A and B for recurrence interval storms used in the hydraulic design.



Source: Clearwater Hydrology, 2006

Figure 3-7
Project Site Vicinity and Watershed Map for Jacques Gulch Sites A and B

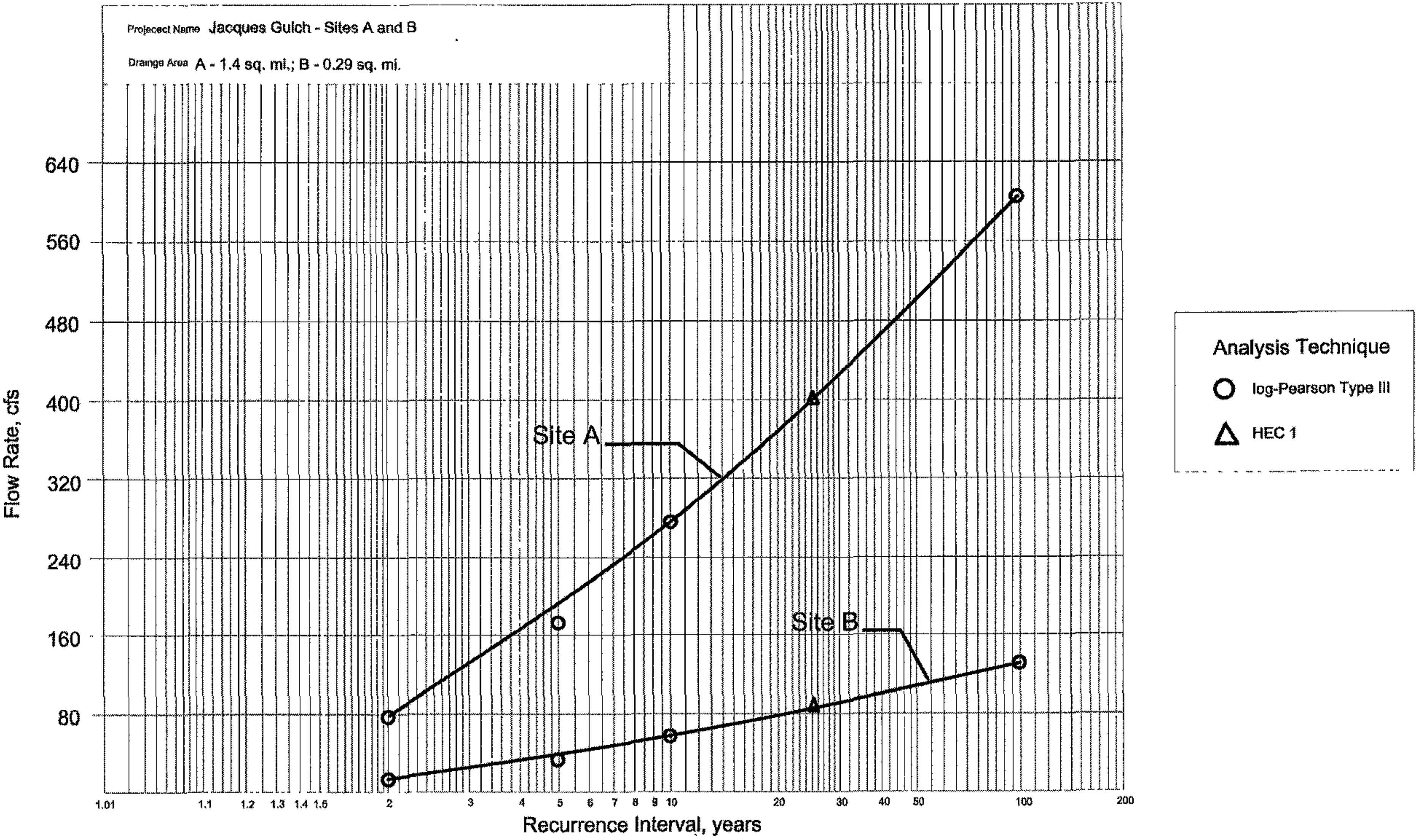


Figure 3-8. Gumbel Arithmetic Probability Plot of Peak Discharges for Jacques Gulch Sites A and B

CLEARWATER HYDROLOGY

Project: Jacques Gulch
Location: Santa Clara County, California
Date: 07/31/06

Filename:JacquesGulch\CAD\Jacques_F_Flow.dwg

Watershed Sediment Yield

The annual sediment yield from the Jacques Gulch Watershed was computed by applying the Revised Universal Soil Loss Equation (RUSLE). The RUSLE, and its predecessor the USLE, were developed by agricultural engineers and soil scientists as tools for estimating soil loss due to small scale surface erosion processes (raindrop and runoff detachment and transport, and rill erosion) on agricultural lands. As the model was tested on lands under different land uses, the accumulated empirical data enabled their extension to non-agricultural settings, including construction sites. The RUSLE differed from the USLE only in the extent or sophistication of the parameter estimation techniques applied. The equation for both the USLE and the RUSLE is:

$$A = R*K*LS*C*P$$

where:

A = average annual soil erosion in tons per acre per year;
R = rainfall intensity factor
K = soil erodibility factor
LS = length-slope factor
C = *cropping and management factor*
P = support practice factor

The rainfall intensity factor (R) is a measure of the energy of rainfall imparted to the soil surface; the soil erodibility factor (K) is a function of the soil texture; the length-slope (LS) factor is a function of the topography and assigns greater soil loss to longer, unbroken slopes; the cropping management (C) factor is a function of the vegetation; and the support practice (P) factor is a measure of the erosion control measures employed, including surface mulching or straw cover, and terrace construction.

For the present analysis, rainfall erosivity index contour maps for San Francisco, California were used. K values were obtained from the Soil Survey for Santa Clara County (SCS 1942). LS values were computed using the RUSLE equations as cited in the RUSLE Handbook (Renard et al. 1997):

$$LS = (\lambda / 72.6)^{M}\,(0.065+0.0454S+0.0065S^{2})$$

where:

λ = Slope length = 249.94 ft.
M = 0.5
S = Slope factor = 38.4

Supplemental equations were used for computing the S (land slope) factor and the λ factor for the slope length. Using the data sources described above, the RUSLE parameter values used in the Site A Watershed calculation are shown below:

RUSLE Parameter

R = 45
K = 0.23
LS = 21.14
C = 0.0027
P = 1.0
A = 0.610 tons per acre per year = 554 tons/year = 499 cubic yards/year

For the determined parameter values, the annual sediment loss computed for the watershed draining through Site A via the RUSLE was 499 cubic yards (cy). A sediment delivery ratio of 0.35 was applied to the soil loss total to convert it to an annual watershed sediment yield. The delivery ratio was obtained from Chapter 6 of the NRCS National Engineering Handbook (USDA 1983). The resulting watershed sediment yield from hillslope erosion alone was computed to be 174.3 cy per year. Since the RUSLE estimates only surface erosion, erosion due to channel bank scour was also assessed. Annual channel erosion was estimated by assuming 1 inch of lateral bank erosion for each lineal foot of the main stem channels and its principal tributaries, including the Site B tributary. The assumed average bankfull depth for the contributing channels was 2.0 feet. The 1 inch of bank scour (per bank) compensated for the neglect of both the remaining smaller tributaries and watershed gully erosion. For the roughly 21,440 ft. of delineated main stem and principal tributary channels, the computed annual watershed sediment loss from these source areas was 264 cy. The sediment delivery ratio assigned to channel sources was 1.0, due to their instream position and the certainty of near-term downstream transport. In total, the annual volume conveyed to Site A is estimated to be 438 cy (174.3 + 264 = 438.3).

3.1.3 Hydraulics

Hydraulic analysis conducted for the Jacques Gulch restoration design comprised two essentially independent hydraulic analyses: the equilibrium channel design for the newly configured restoration channel reaches, and the Alamitos Road culvert analysis. The equilibrium channel analysis included field surveys of prospective stable reference channel reaches and the application of simple hydraulic and sediment transport models, as well as regional regression equations, to determine the equilibrium hydraulic geometry for the design reaches. Equilibrium channel evaluation included identification of reference channel cross-sections for Sites A and B, and application of regional regression curves developed by Dunne and Leopold (1978), standard normal depth computation programs, and the USACE Stable Channel Analytical Model (SAM). Each of these analytic approaches was applied to the various morphological reaches in Sites A and B. However, the SAM approach was ultimately dropped from consideration due to a conflict between model assumptions and the hydraulic and geomorphic conditions in the subject reaches. The equilibrium channel analysis is discussed in Section 3.1.1 above. For the Alamitos Road culvert analysis, the USACE's HEC-RAS (River Analysis System 2001, Ver. 3.0.1) was used to model floodflow behavior during the design 20-yr. flood. This recurrence interval flood is the design standard used by the Santa Clara County Department of Public Works for rural roads under its jurisdiction.

Hydraulic roughness values used in both the hydraulic conveyance computations and the HEC-RAS modeling of Site A reach floodflows and culvert hydraulics, referred to as Manning's *n* values, were determined for the design conditions for the Site A and Site B channel reaches on the basis of joint field interpretation by the project fluvial geomorphologist and hydraulic engineer. For the design bankfull discharge ($Q_{2\text{-yr}}$), the existing and design condition channel roughness was deemed roughly equivalent at 0.035. Both the majority of the non-culverted portion of the Site A reach and the lower, re-aligned portion of the Site B reach currently display similar bed and bank material (e.g., gravel and cobble armoring overlying a sandy, gravelly substrate) and erodible, unvegetated banks. For the Alamitos Road culvert, assigned *n* values ranged from 0.026 for the existing corrugated metal culvert configuration (Alternative 2) to 0.020 for the single design, reinforced concrete pipe (RCP) culvert (Alternatives 1 and 3). For a smooth reinforced concrete pipe conveying clear water or a minimal fine-grained sediment load, the *n* value *specified by the culvert manufacturers is typically 0.012-0.014. However, for Jacques Gulch and* its substantial coarse-grained bedload, the elevated value of 0.020 was deemed more representative of field conditions during significant flows, including the 2-yr. and 20-yr. flow events.

Under current conditions, flows from Jacques Gulch pass under Alamitos Road in three corrugated metal culverts. The principal culvert is a 48-inch CMP, which has upstream and downstream invert elevations of 607.9 ft. and 607.0 ft. National Geodetic Vertical Datum (NGVD), respectively. Two additional corrugated metal arch culverts sit atop the main culvert within less than one foot of the main culvert crown. Both culverts have inlet invert elevations of 612.5 ft. NGVD and outlet invert elevations of 611.1 ft. NGVD. Each of the three culverts in the array spans a distance of roughly 50 feet. There is no headwall per se surrounding the culvert inlets; however, concrete rubble occupies both the spaces between the culverts and their immediate perimeter. Field inspection of the upstream inlet area indicated some piping of fine material through voids in the rubble, which may have some connection to the generally uneven roadway surface in the vicinity of the crossing (i.e., due to differential settling of the road fill). The culvert outlets are significantly elevated above the local outlet channel in the reservoir and are lightly rocked to provide minimal energy dissipation for culvert outflows. Under most operating conditions, flows from the culverts spring from the pipes as free jets. Only under significantly elevated reservoir levels would culvert tailwater elevations infringe on the pipe discharge and alter the hydraulic behavior of culvert flows.

A level survey of the Alamitos Road crossing area was conducted to determine the low point at which high magnitude floodflows overtop the roadway embankment and continue downslope to the eastern road embankment and the Almaden Reservoir. The survey indicated that floodflows exit first south of the culverts, at the northwest corner of the intersection with Hicks Road, and then move east-southeast to a roughly 60-ft.-long section of the Alamitos Road shoulder. Here, flows eventually top an asphalt berm along the edge of the road shoulder and discharge onto the road/reservoir embankment. At two or three locations along this overflow zone, the earthen, unreinforced embankment has been severely eroded, potentially endangering the integrity of Alamitos Road. As noted above, while some rock has been placed for localized energy dissipation below the culvert outlets, the downslope road embankment is not stabilized with rock riprap.

The County of Santa Clara Department of Public Works' standards for culvert design at rural road crossings such as Alamitos Road require that a single culvert or culvert array convey the 20-yr. design flood discharge with one foot of freeboard. The HEC-RAS River Analysis System was used to assess the hydraulic capacity of the existing culvert array and to determine whether it meets the County's performance standard. The modeled channel reach of Jacques Gulch extended from a point 38 ft. downstream of the pipe outlets (Station 0+00) to the upper end of Site A (Station 8+42). A range of channel discharges was input to the model, which defined the existing main stem channel in accordance with cross-section topography derived from the District aerial topographic survey for the project. The flood simulations yielded channel discharges of 209 cfs and 170 cfs, respectively, for the no freeboard and one foot freeboard conditions at Alamitos Road. Based on an arithmetic probability plot constructed for the HEC-1 derived design discharges, the modeled discharges correspond to approximately the 6-yr. and 4-yr. recurrence interval events, respectively.

To provide a culvert that conforms to current County standards, the HEC-RAS model was modified to include a single new culvert. Using iterative model runs, it was determined that a single 84-inch reinforced concrete pipe would convey the 20-yr. flood discharge (373 cfs) with one foot of freeboard at the Alamitos Road crossing. The resulting culvert design would be comprised of an 84-inch RCP, with inlet and outlet invert elevations of 606.0 ft. NGVD and 599.0 ft. NGVD. Thus, the invert elevation at the inlet would be 1.9 ft. lower than the current 48-inch CMP, while the outlet invert would be 12.1 ft. lower than that of the existing pipe.

3.2 Soils and Groundwater Hydrology

3.2.1 Soils

The generalized soils found in Jacques Gulch are shown on Figure 3.4, and discussed in Section 3.1.1. This discussion below describes the characteristics of the soils found at the project sites and is based on the geotechnical investigation of the sites (Northgate 2006).

Site A. Subsurface soil conditions at Site A consist of native alluvial (soils laid down by running water) or colluvial (soils derived from weathered rock that have been moved by gravity) overlain in some areas by calcine. The native alluvial soils consist of various layers of sandy gravel, gravelly sand, silty sand and sandy clay. The colluvial soils consist of silt. In the area near Alamitos Road, the alluvial soils consist of dense sandy gravel in the top 3 to 4 feet below ground surface (bgs). Loose sandy layers were found beneath the sandy gravel that extended to the bottom of exploratory borings at a depth of 15 feet. Upstream, the gravelly and sandy layers became medium dense and dense.

The calcine soils are sandy gravel and reddish brown in color. The calcine is mixed with native alluvial sands and gravels. The calcine is generally medium dense and dense. Where exposed in the bottom of the creek, the calcine is cemented and is very dense, resembling concrete. This very dense cemented layer is approximately 1 foot thick.

Bedrock is visible in outcrops along the upstream portion of Site A. Bedrock appeared to be highly fractured, gray, basaltic volcanic rock.

Site B. Subsurface soil conditions at Site B consist of native colluvial soil consisting of dark brown, silty, and sandy clays. In the lower portion of Site B, the colluvium is overlain by calcine which is mixed with native alluvial sands and gravels. The calcine soils are sandy gravel or gravelly sand and reddish brown in color. The calcine is generally medium dense and dense. Where exposed in the bottom of the creek and in some of the exposed erosional features, the calcine is cemented and very dense, resembling concrete. This very dense cemented layer is approximately 1 foot thick. In the mid- to upper portion of the Site, the calcine generally filled the original creek channel. Subsequently, the creek has incised and down-cut into the material. The calcine in this area does not appear to contain alluvial materials.

Gray, highly fractured basaltic volcanic bedrock is encountered in some of the borings and test pits. Bedrock is also visible in outcrops along the creek in the upper portion of the Site. In and near the creek channel, a layer of very dense gravel and cobble deposits is present above the bedrock.

Alamitos Road Area. The soils in the area of Alamitos Road consist of 8-1/2 feet of loose silty sand and medium stiff sandy clay fill with a trace of gravel and fragments of asphalt and brick. Native stiff sandy clay was encountered below the fill and extended to bedrock at a depth of 21 feet. The bedrock is sandstone and greenstone.

3.2.2 Groundwater Hydrology

In Site A, groundwater was encountered in some exploratory test pits and exploratory borings at depths between 5-1/2 and 8 feet below the ground surface (bgs). Although the exploratory work was done at the driest time of the year, groundwater was present where calcine is found in the creek bottom in the upper portion of Site A. In the lower portion of Site A, the groundwater was below the creek bottom surface.

Groundwater was not encountered in Site B or in the Alamitos Road area.

During the wet season, the creek will be flowing and groundwater may be at significantly higher levels and may be found in areas noted as being dry at the time of the investigation.

3.3 Biological Resources

Biological resources discussed below include vegetation, special status plant and wildlife species.

3.3.1 Vegetation

Historic Vegetation

Historic riparian vegetation has been reduced by the deposition of calcine in the mid 20th century. Dense riparian tree and shrub vegetation on stream terraces and adjacent upland slopes has been replaced by a sparse growth of non-native annual grasses on calcine deposits.

Calcine has reduced the area suitable for wetland riparian species by raising the elevation of streamside terraces relative to the channel and water table. The higher calcine terraces were drier than pre-calcine terraces and were generally not colonized by more drought tolerant upland trees that might be expected to survive at that elevation.

Calcine deposition up to 8 feet deep buried the pre-existing riparian vegetation. While many trees likely died, several large trees including sycamores, willows and oaks have survived burial by up to 4 feet of calcine. Following this disturbance, colonization of calcine by riparian and upland trees and shrubs was limited by compaction and poor nutrient status of the calcine. The high density of calcine provides low water holding capacity and restricts root growth and seedling establishment. Lack of soil organic matter also would provide a poor supply of nutrients for plant growth.

Density of trees in adjacent unaffected upland oak woodland was likely lower in the past. Fire frequency has likely declined in the recent past as a result of active fire suppression. In the more distant past fire was used by Spanish ranchers and Native Americans as a vegetation management tool to reduce tree and shrub cover and improve forage for livestock and wildlife respectively. Past livestock grazing may have also reduced tree establishment.

Existing Vegetation

Existing vegetation on calcine terraces is dominated by non-native annual grasses such as wild oats (*Avena fatua*), ripgut (*Bromus diandrus*) and hedgehog dogtail (*Cynocurus echinatus*) and herbs such as Italian thistle (*Carduus pycnocephalus*) and yellow star-thistle (*Centauea solstitialis*). Height and cover is low relative to adjacent grassland on native soils. Shrubs and trees are generally absent except along the channel edge where unconsolidated substrate may contain non-calcine sediment and seasonal water is available. When present, the canopy above the calcine is generally composed of overhanging trees rooted on adjacent native soils and older trees rooted in native soils below the calcine deposits.

The geotechnical investigation included several trenches located adjacent to large trees surrounded by calcine. Buried bark and trunk flare indicated that these trees had been growing in native soils when the calcine was deposited. The three trees investigated, including one sycamore (*Plantanus racemosa*) and two blue oaks (*Quercus douglasii*), had not developed roots into the calcine and the large supporting roots in the native soils appeared healthy. This indicates that the trees in the project area rooted in native soils may survive when the calcine is removed.

Site A

Geotechnical borings conducted in September 2005 in the downstream portion of Site A detected groundwater at a depth of five feet below the surface of the channel and seven feet below the terraced bank in the lower two thirds of this reach. In the upper third of this reach, stream flow was at the surface on exposed bedrock and cemented calcine during the fall of 2005.

This intermittent flow and perennial high water table at Site A supports a relatively diverse flora of woody riparian species such as white alder (*Alnus rhombifolia*), western sycamore (*Platanus racemosa*), red willow (*Salix laevigata*), arroyo willow (*Salix lasiolepis*) and sandbar willow (*Salix exigua*). Shrubs on stream terraces include mulefat (*Baccharis salicifolia*). Adjacent upland slopes contain California bay (*Umbellularia californica*), coast live oaks (*Quercus agrifolia*), valley oaks (*Quercus lobata*), and blue oaks (*Quercus douglasii*). Recruitment of sycamore, alder, willow, and coyote brush is occurring in the lower reach.

In the upper third of Site A, a dense riparian canopy south of the channel is composed of mature California bay rooted in native soil on the adjacent slope and a large sycamore and red willow rooted below the calcine. The understory is devoid of vegetation due to the calcine substrate and extensive shading created by the thick canopy cover. White alder and sycamore seedlings have colonized native sedimentary bedrock and alluvium in and along the stream channel where surface flow may be perennial.

The central reach of Site A has a more open canopy structure due to the reduced amount of overhanging canopy and the lack of trees rooted below the calcine. Calcine deposits form treeless terraces a few feet above the channel on either side. The channel edge has young woody riparian vegetation consisting of sycamore, alder, willow, bay and mulefat. The understory is vegetated native herbaceous species such as mugwort (*Artemisia douglasiana*), and iris-leafed rush (*Juncus xiphiodes*) and non-native species including rabbitsfoot grass (*Polypogon monspeliensis*), Italian thistle (*Carduus pycnocephalus*), brome grass (*Bromus sp.*), wild oat (*Avena sp.*), and ryegrass (*Lolium multiflorum*). Blue and coast live oaks grow sporadically beyond the terrace and are underlain by a variety of native and non-native upland herbaceous species.

The lower reach of Site A consists of a broad floodplain terrace formed from non-calcine alluvium with a small section of braided channel. Woody riparian vegetation includes red willow, blue elderberry (*Sambucus mexicana*), and mulefat. Upland islands within the braided channel are vegetated with small willows, mulefat, mugwort, coyote brush (*Baccharis pilularis*) and Spanish broom (*Spartium junceum*; CAL-IPC "High" invasive rating).

Site B

Flow in the small tributary in Site B is ephemeral with no near surface groundwater in the dry season. Shallow geotechnical trenches and borings up to six feet deep did not encounter groundwater. The upper portion of this reach consists of a deeply eroded narrow channel contained within vertical banks of calcine up to eight feet high. The lower portion has a broad low terrace of calcine. Western sycamore, the only true riparian species that occurs in Site B, indicates that subsurface moisture may be present. However, the site appears to be significantly drier than Site A with shallow bedrock visible in the channel bottom and willows conspicuously absent.

Vegetation on calcine in the upper portion of Site B is dominated by non-native annual species including hedgehog dogtail, stickseed (*Torilis arvensis*) and Italian thistle and native species such as blue wild rye (*Elymus glaucus*) and poison oak (*Toxicodendron diversilobum*). Several medium-size blue oak and valley oak are rooted below the calcine on the native soil of side slopes. A few blue oaks have colonized where native alluvium appears to have been deposited on terraces from small hillside drainages. Adjacent native soil slopes support California bay and mixed oak woodland forming a nearly closed canopy above the narrow channel. Several small western sycamores occur on the native bedrock channel bed.

Vegetation on the slopes adjacent to the lower portion of Site B is non-native annual grassland dominated by wild oats, ripgut and yellow star-thistle. Blue oak and valley oak occur on the adjacent slopes. Several very large sycamores occur along the channel, the roots of which form a series of natural step pools.

Special Status Plants

Special status plants known to exist in the vicinity of the project site include grassland, chaparral and serpentine species. Early season surveys conducted to date found no special status species.

The soils in the project area and vicinity to the northeast are mapped as Montara rocky clay loam, 15 to 50 percent slopes (USDA, 1968). The Montara series is typically underlain by serpentine bedrock at 8 to 16 inches below the soil surface. However, no serpentine bedrock was observed in the geotechnical investigation of the project area. Stream sediments contain some serpentine presumably from the upper watershed to the northeast which is mapped as the serpentine containing Montara series. Soils in the project area appear to be derived from sandstone and are similar to the Los Gatos series that is mapped on the adjacent slopes southeast of Hicks Road.

Several large non-serpentine rock outcrops also occur in the lower half of Site B and harbor many individuals of dudleya (*Dudleya cymosa*). Although the project area is mapped as containing serpentine soils, the federally endangered Santa Clara Valley Dudleya (*Dudleya setchellii*) does not occur.

A small stand of the Loma Prieta hoita (*Hoita strobilina*; CNPS list 1B) occurs in the upper section of Site B. These perennial plants are growing on a terrace that is mapped as calcine. A mitigation and monitoring plan, including transplanting and contingency propagation, would be prepared in consultation with CDFG to mitigate disturbance to this stand.

3.3.2 Wildlife

Historic Wildlife

Wildlife species occurring in this area historically were likely similar to those existing here today and associated with riparian and oak woodland habitats. The wildlife species drawn to the reservoir, such as waterfowl, probably did not utilize this area historically. In addition, introduced species detected during site visits and reliant upon the reservoir, such as bullfrogs and largemouth bass, have become established in the watershed but would not occur here naturally.

The federally threatened steelhead (*Oncorhynchus mykiss*) may have occurred historically in this drainage, but currently the presence of the dam at Almaden Reservoir would prevent this anadromous fish from migrating from the ocean. Water flows from both Jacques Gulch and the unnamed tributary in Site B into the reservoir are probably similar to their historic flows as they are runoff- and spring-fed. Riparian habitat would be expected to be denser historically due to the lack of disturbance from humans and domesticated animals, and access to water in the gulch would have been easier for wildlife species without the heavily incised banks caused by the presence of calcine deposits.

Existing Wildlife

Existing wildlife species in Sites A and B are those species commonly associated with oak woodland and riparian habitat. Aquatic invertebrates observed in Jacques Gulch include predacious diving beetles (*Dytiscidae* family), dragonfly nymphs (*Anisoptera* group), water striders (*Gerridae* family) and dobsonfly (*Corydalus* sp.) larvae. Herpetofauna identified on site include Western Fence Lizard (*Sceloporus occidentalis*), Southern Alligator Lizard (*Elgaria multicarinata*), Western Skink (*Eumeces skiltonianus*), Western Toad (*Bufo boreas*), Pacific Tree Frog (*Pseudacris regilla*) and American Bullfrog. Some avian species seen during site visits include Red-shouldered Hawk (*Buteo lineatu*), California Quail (*Callipepla californica*), Northern Flicker (*Colaptes auratus*), Western Scrub Jay (*Aphelocoma californica*), Black Phoebe (*Sayornis nigricans*), Anna's Hummingbird (*Calypte anna*), Western Screech Owl (*Otus kennicottii*) and Barn Owl (*Tyto alba*). Rainbow trout (*Oncorhynchus mykiss*) and sculpin (*Cottus* sp.) were seen in Jacques Gulch as well as largemouth bass in Almaden Reservoir. Mammal or mammal signs detected include western harvest mouse (*Reithrodontomys megalotis*), mule deer (*Odocoileus hemionus*), raccoon (*Procyon lotor*), coyote (*Canis latrans*) and mountain lion (*Felis concolor*) (WRA, 2005a).

Aquatic Habitat

Site A includes part of Jacques Gulch that contains an intermittent stream. Site A had flowing water whereas Site B was completely dry during a September 2005 site visit (WRA, 2005a). Site B provides suitable habitat for fish and amphibian species during the winter and early spring but provides no suitable aquatic habitat by summer's end.

Sculpin (*Cottus sp.*) were seen in the shallow portions of the stream and a few rainbow trout (*Onchorhynchus mykiss*) were stranded in some of the larger pools upstream of Site A (WRA, 2005a). A culvert runs from Site A underneath Alamitos Road and at the time, ended approximately 2 to 4 feet above the water level of Almaden Reservoir. This barrier is expected to prevent any upstream movement of fish species from the reservoir and into the gulch except during extremely high water levels.

The aquatic habitat in Site B is ephemeral, dries during the summer, and has deeply incised, very high banks, which makes access for wildlife species very difficult. Site A, which may contain water year round, has no plunge pools and is relatively exposed due to its lack of riparian vegetation. Both sites experience high winter water flows, making reproduction for amphibian species difficult. A habitat structure containing plunge pools, more instream and overhead cover, as well as more riparian and emergent vegetation would be better suited for wildlife species.

Special Status Wildlife

Amphibians

The study area is within the historic range of the threatened California Red-legged Frog (CRLF) and California Tiger Salamander (CTS). The *Almaden Quicksilver Restoration Plan and Environmental Assessment Public Review Draft* recommended surveys for both of these amphibians in order to determine the appropriate level of biological monitoring during the construction season. An assessment is required before the initiation of surveys for both species. The CTS assessment determined that neither study area contained suitable habitat for the CTS and therefore no impacts associated with the restoration project would be anticipated and mitigation measures and surveys would not be necessary (WRA, 2005b). The CRLF and other sensitive species that have the potential to be affected by the proposed project are discussed below.

California Red-legged Frog (*Rana aurora draytonii*). The CRLF Habitat Assessment for Jacques Gulch (WRA, 2005a) concluded that there was potential CRLF breeding habitat in the western-most portion of Site A, where a spring provided perennial aquatic habitat, as well as Almaden Reservoir. Surveys were initiated following the *Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog* (USFWS 2005) in the summer of 2005.

Foothill Yellow-legged Frog (*Rana boylii*). Although the FYF was determined to have a low potential for occurrence in the Study Area (WRA 2005a) due to the lack of quality aquatic habitat, protocol level surveys for the CRLF will also be useful in detecting the presence of FYF.

Reptiles

The Western Pond Turtle (*Clemmys marmorata*), California Horned Lizard (*Phrynosoma coronatum frontale*) and Silvery Legless Lizard (*Anniella pulchra pulchra*) all have the potential to occur in or near the project area.

Special Status Mammals

The San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*), a USFWS Species of Concern and CDFG Species of Special Concern, has been detected on site. This species inhabits hardwood forests of moderate canopy with a moderate to dense understory. Nests are constructed out of sticks, leaves, shredded grass, and other material.

The small-footed Myotis (*Myotis leibii*), long-eared myotis (*Myotis evotis*), fringed myotis (*Myotis thysanodes*), long-legged myotis (*Myotis volans*), pallid bat (*Antrozous pallidus*), greater western mastiff bat (*Eumops perotis californicus*), Townsend's western big-eared bat (*Corynorhinus townsendii townsendii*) and Yuma myotis (*Myotis yumanensis)* all have the potential to occur in or near the project area.

Special Status Avian Species

The Long-eared Owl (*Asio otus*), Lewis's Woodpecker (*Melanerpes lewis*), Red-breasted Sapsucker (*Sphyrapicus ruber*), Vaux's Swift *(Chaetura vauxi*), Black Swift (*Cypseloides niger*), Allen's Hummingbird (*Selasphorus sasin*), Olive-sided Flycatcher *(Contopus cooperi*), Loggerhead Shrike (*Lanius ludovicianus*), California Yellow Warbler (*Dendroica petechia brewsteri*) and White-tailed Kite (*Elanus caeruleus*) all have the potential to occur on or near the project site.

3.3.3 Project Area Design Constraints

Wildlife

Avian and Mammalian Species

A number of large trees and snags are located in and near both study areas. Snags and large trees are an important habitat requirement for bats and cavity nesting bird species. Removal or trimming of large trees is expected to occur minimally; however, removal of calcine deposits near and around the larger trees has the potential to disturb or harass these potential roosting sites during daylight hours. If this work is to take place during summer months when bats may be roosting, a bat survey should be conducted. The field survey should be conducted in late April or early May, when bats are establishing maternity roosts but before the females give birth. If no roosting bats are found, no further mitigation would be required. If bats are detected, three options may be available. The preferred option would be to avoid disturbance near the tree (a minimum ous favorable conditions coincide. Seed production, rainfall and temperature patterns and impact from herbivores and pathogens all must be favorable for seedling to survive the first several years.

The riparian tree species that would be expected to colonize disturbed or unvegetated stream floodplain include oak, bay, sycamore, willow and alder. These species may establish readily on exposed native soils following erosion or deposition of sediment. Seedlings and saplings of these species have been observed in the project area. Long-lived species such as valley oak need only be established infrequently and may require an unusually wet season or shelter of existing shrubs to become established. In dense canopies, tree seedlings may establish in favorable years but remain in a sapling stage until disturbance or mortality creates a canopy gap. Although natural recruitment may re-establish riparian vegetation in the project area over time, this planting program is intended to speed the revegetation process and allow development of a diverse vegetation species composition.

Important considerations in developing the planting program to meet this objective are species selection, use of irrigation, plant propagule type and planting method, density and frequency. Probably the most important consideration that affects other components of the planting design is whether to use irrigation to establish plants. On ephemeral and intermittent streams such as at project site, tree seedlings survive when roots are able to grow fast enough to maintain contact with a dropping water table. Upland trees in drier locations must also grow quickly to keep in touch with decreasing depth to soil moisture. Irrigation or supplemental water is often used to ensure that plants will survive in years when rainfall and temperature patterns are not optimal.

Use of a conventional irrigation system on this remote site would be difficult and potentially cost prohibitive. Installation and removal of a temporary water tank above the site would be necessary. Apparent lack of a domestic water source would require filling of the tank by well, pump or truck. Water demand would be very high on stream terraces with coarse alluvial sand and gravel substrate. Therefore, the frequent refilling of a remote tank by water truck that would be necessary would likely be cost prohibitive. Vandalism, which occurred to heavy equipment during the geotechnical investigation of the project area, would be a likely threat to the reliability of the system. In addition, irrigation systems on stream terraces would be subject to damage from high flows.

Alternative supplemental water does not appear to be feasible. Direct watering of seedlings with trucked water would likely be cost prohibitive due to the frequency and quantity of water necessary considering the low water holding capacity of the coarse substrate on the stream terraces. The coarse soil would also make slow release water gels, such as Driwater, infeasible because water gels do not provide adequate distribution or quantity of water in coarse soils.

Irrigation may also negatively affect seedling growth. In order to survive the first growing season, tree seedlings must develop a deep root system to adequate deep soil moisture during the first year of growth. Inadequate, shallow irrigation promotes a shallow root system that may lack the deep tap root necessary for survival after irrigation. In addition, recent research indicates that in some conditions, irrigation does not produce significant additional growth of oak seedlings after the first year (Costello et al, 2005). Irrigation of oak (*Quercus* spp.) and California bay (*Umbellularia californica*) during summer months may promote fungal infection including *Phytophthora ramorum* (sudden oak death).

Several planting methods are proposed that allow establishment of trees without irrigation. Cuttings and seeds will be used instead of nursery-grown plants. This allows higher density, lower-cost plantings than from containers. Plants will be installed at densities estimated to allow for mortality, minimize competition and result in spacing at maturity appropriate for the conditions of each reach. Two years of replacement planting is recommended to allow for expected mortality. Density at the end of the first three years will be higher than estimated mature density to allow for on-going mortality. Mortality is expected to be high during the initial planting period. Additional mortality of installed plants is likely between establishment and maturity. Natural recruitment following initial plant establishment is expected and will result in more natural age classes.

Species Selection

Each site has been divided into two reaches with topographic, hydrologic and substrate conditions that warrant selection of different species as summarized in Table 3-6.

Plant Propagation and Installation

The planting program has been designed without irrigation to allow for natural variation in conditions that favor tree seedling establishment. Planting methods have been developed to maximize success without irrigation. Plants will be planted much more densely than found in natural *conditions to allow for mortality. Replanting will take place one and two years after the initial* planting if a high initial mortality results in the first year. Seeds and tree poles will be planted instead of containerized stock, when possible.

Specifically, acorns will be planted instead of oak seedlings. It is anticipated that planting acorns will enhance the success of the oak trees long-term because it will be adapted from the start to the planting site's micro-climate, topography and soil conditions, producing initially a tree with the correct root to shoot ratio. Containerized oak seedlings are prone to becoming "pot-bound" or having constricted and contorted root systems as a result of their early start in containers. To promote a deeper tap root, the planting hole for each acorn will be dug several inches deep and then refilled to plant the acorn at a depth of one to two inches. Planting will be conducted between November and January after winter rains begin and soil moisture reaches a depth of eight to ten inches.

Table 3-6. Plant Species for Various Hydrologic and Substrate Conditions at Sites A and B

Planting Area	Position	Substrate	Dry Season Water Table	Species
Site A lower	Detention Basin	Alluvium	5–7 ft	*Salix exigua,* *Baccharis salicifolius*
Site A upper	Flood terrace	Alluvium	5–7 ft	*Alnus rhombifolia* *Platanus racemosa* *Salix laevigata* *Salix lasiolepis* *Artemisia douglasiana* *Juncus xiphiodes*
Site B lower	Flood terrace, Slopes	Alluvium, Loam	None	*Platanus racemosa* *Quercus douglasii* *Quercus lobata* *Artemisia californica* *Baccharis pilularis*
Site B upper	Slopes	Loam	None	*Quercus agrifolia* *Quercus douglasii* *Quercus lobata*

Willow and sycamore poles will be planted instead of containerized stock. Poles will be planted in late winter or early spring before the buds break dormancy. Holes will be dug to determine the level of the groundwater at the time of planting. Poles will be planted such that the bottom of the pole is a few inches below the level of the groundwater.

Species that cannot be planted as poles or seed will be planted as bare root or containerized nursery stock. Bare root or containerized plants will be planted in the late fall or early winter after rains have begun to ensure that water is available during the period of establishment.

Weed Control

It is anticipated that the planting areas will be relatively free of weed seed sources because of the removal of the topsoil along with calcine deposits. Strategies to discourage weeds will target weeds at the time of planting and in the two years following the initial planting when weed competition has greatest impact on young plants. Initially, each planting will be centered within a 3-foot by 3-foot weed mat. Mulch will be placed over the weed mat in a three foot radius around each plant to a depth of three inches and will be replaced in the following two years. Annual removal of weeds will also be provided in the two years after planting. Weeds within three feet of each surviving plant will be targeted rather than the entire planting area.

Herbivory Control

Plant cages will be placed around each plant or acorn at the time of planting. Plant screens will deter rodents and deer from eating newly planted acorns or plants. Clusters of plants may be screened together or the entire riparian area may be fenced as a more cost effective alternative to plant screens.

3.4 Land Use, Infrastructure, and Public Health and Safety

3.4.1 Land Use

The project area is isolated from developed land uses. The nearest residential properties are approximately 0.25 miles south of Site A, along the extension of Alamitos Road past the Hicks Road intersection. The project area is a Resource Conservation Area, designated as Regional Park. Overlaying this designation in the County General Plan is a Special Land Use Area, the New Almaden Historic Area. The restoration project would be in compliance with the County General Plan.

3.4.2 Infrastructure

Because of its remoteness, there is little existing infrastructure serving the project area. Electric and telephone lines extend along Alamitos Road but would be unaffected by the project. The only other element of infrastructure in the immediate vicinity of the project is the county road system, specifically Alamitos Road and Hicks Road. There are no sewer or water services available. During construction, water for dust control and drinking would be trucked to the site. Sanitary facilities would be portable units typical of construction sites.

3.5 Cultural Resources

3.5.1 Pre-History and Ethnography

Data recovered from Delta and Bay Area archaeological sites indicate a widespread but sparsely populated culture of hunters and gatherers in the project area as early as 5,660 years ago. This culture was replaced around 3,950 years ago by one adapted to bayshore and marshland habitation. By 3,400 years ago, this latter group had settled in the southern Bay Area. From there they spread northward to the peninsula, westward to the coast, and southward to the Santa Clara Valley. They would remain in these areas until historic times. By 1,920 years ago, the dominant cultural pattern had developed into one utilizing bow and arrow, tubular tobacco pipe, cremation, intensive acorn utilization, and complicated exchange systems. This emerging pattern was destroyed by the Spanish mission system and subsequent historical developments.

The project area lies within the region occupied by the Ohlone people at the time of historic contact with Europeans. On the basis of linguistic evidence, it has been suggested that the ancestors of the Ohlone arrived in the San Francisco Bay area about 1,500 years ago, having moved south and west from the Sacramento–San Joaquin Delta region. The ancestral Ohlone were probably a significant contributor to the developing cultural pattern that became dominant in the Bay Area in the 1,000 years preceding European contact.

The Ohlone were hunters and gatherers, whose subsistence was based primarily on acorns and seafoods, such as mussels. Seeds and berries, roots and grasses, as well as the meat of deer, elk, grizzly, rabbit, and squirrel were part of the Ohlone diet. Extended families lived in domed structures thatched with tule, grass, wild alfalfa, or ferns. Semisubterranean sweathouses were built into pits excavated next to streams and covered with a structure. Leadership was provided by a chief, who could be either a man or a woman, and who inherited the position patrilineally. The chief and a council of elders served the community as advisers. After the arrival of the Spanish in the San Francisco Bay Area in 1775, disease, declining birth rates, and the effects of the mission system led to a major reduction in native populations and largely eradicated the traditional lifeways.

3.5.2 History

The first Europeans to explore the Santa Clara region included Gaspar de Portolá in 1769, Pedro Fages in 1772, and Juan Bautista de Anza and Father Peña in 1776. Both Portolá and Anza noted large numbers of Native Americans inhabiting the area at that time. Spanish settlement of the region commenced in 1777, when Father Junipero Serra founded the Mission Santa Clara de Asis. Mexico won independence from Spain in 1822, and Mexican rule resulted in the secularization of the churches, and the sale of property belonging to the missions. Large land grants, known as ranchos, were allotted to citizens for stock grazing. Americans and British began to immigrate to Alta California, becoming Mexican citizens and obtaining land grants. California was officially annexed to the United States in 1848 as part of the Treaty of Guadalupe Hidalgo.

New townships began to develop within Santa Clara County following the Gold Rush of 1849. The construction of the railroad provided access to distant markets, and discovery of artesian well water beneath the Santa Clara Valley resulted in the development of agriculture and an increase in population. Carrots, almonds, prunes, plums, tomatoes, apricots, pears, cherries and walnuts were grown in the County, and seed farms were introduced in the last half of the 1870s. Other industries in the region at that time included oil, lumber and winemaking. The County remained primarily rural and agricultural until after World War II.

3.5.3 History of the New Almaden Mine

The cinnabar deposits within the region now referred to as New Almaden were recognized as early as 1824, when Secundino Robles, Don Antonio Suñol and Luis Chabolla, attempted to find gold or silver in the deposit to no avail. They almost immediately abandoned the excavation, which came to be known as "La Mina Santa Clara."

Three years later, a deputy of the Mexican government, Andrés Castillero, inquired into the source of the red material used as pigment by local Native Americans. He then filed a claim for the mine and claimed to have discovered silver with a vein of gold. After conducting some basic tests, Castillero, who was trained in geology, chemistry and metallurgy, reported finding "liquid quicksilver." Castillero was subsequently summoned into the Mexican military and never returned to the claim.

Castillero and Juan Castro sold their shares in the mine to Barron, Forbes Company of Tepic, Mexico, who renamed the claim New Almaden after the Almaden Mine in Spain. Alexander Forbes and a large contingent of workers and equipment arrived at New Almaden in 1848. Following the discovery of gold at Coloma, demand increased for mercury to be used in the gold reduction processes. New Almaden would become one of the most productive and well-known mercury mines in the world.

The Barron, Forbes Company operated New Almaden until 1863 when, following several years of litigation, the Quicksilver Mining Company of New York and Pennsylvania took over operations. At that time, the majority of New Almaden's population consisted of Mexican miners and their families. The president of the company, Samuel Butterworth, sought to increase mine productivity and improve the welfare of the mine workers. A company store and schoolhouse were built on Mine Hill, a tramway system for transporting ore was constructed, and regulations regarding working and living conditions were established. By the mid-1860s, approximately 1,800 people were living on Mine Hill with some 700 buildings in existence.

In 1870, a new general manager of the Baron, Forbes Company, James B. Randol, reorganized the structure of the company and encouraged Cornish miners to come work the mine, thus establishing Englishtown, which included residences, a schoolhouse, a boarding house, a community center and a Methodist Episcopal Church. This resulted in a decrease in the number of Mexican residents in New Almaden and by the early 1900s few Mexicans remained. In 1871, a deep exploration shaft was constructed under Randol's direction, which proved to be an extremely rich source of ore. The mine's heyday was during Randol's superintendence.

Following Randol's retirement in 1892 and the appointment of Robert Bulmore as his replacement, mine productivity began to decline. By the early 1900s, ore yield had declined by more than half, and in 1912 the Quicksilver Mining Company declared bankruptcy and ceased its mining activities. During the decline of the Mine Hill operations, a new shaft was constructed at the Senator Mine, in 1909, though by 1912 only the mine and furnace yard tailings were in operation. The Senator Mine was expanded in 1915 and a reduction plant was in use. By 1927 the Senator Mine had failed and operations ceased.

Between 1933 and 1939, Mine Hill was used for housing by the Civilian Conservation Corps, part of the Works Progress Administration. Members of the Corps lived in Englishtown, and built fire roads and lookout towers while serving as firefighters. The Almaden Reservoir, with a surface area of roughly 57 acres, was constructed during this period and was completed in 1935.

The New Almaden Corporation began mining the area again in 1940, constructing a 100 ton rotary furnace, and continued the operation through World War II. In 1968, the New Idria Mining and Chemical Company purchased the New Almaden Mine, as well as the nearby Guadalupe Mine, and continued operations. New Almaden was designated a National Historic Landmark District by the Department of the Interior in 1958, although mining operations continued into the 1970s until declining mercury prices and the discovery of the environmental toxicity of the material resulted in the final closure of New Almaden. In the Jacques Gulch area, calcine deposits (the roasted waste product of mercury mining) have accumulated as a result of mercury mining activities on Mine Hill.

3.5.4 Cultural Resources Investigation

The staff at the California Historical Resources Information System, Northwest Information Center (NWIC) conducted a record search of the project vicinity on May 2, 2006 (NWIC File No. 05-1032). The record search included a review of all cultural resource and excavation reports and recorded archaeological sites within a 0.5-mile radius of the project area. The study included a review of archaeological, ethnographic, historical, and environmental literature, as well as records and maps on file at the California Archaeological Inventory.

The NWIC records search indicated that one cultural resource has been previously recorded within a 0.5-mile radius of the project area: the New Almaden Historic District. The resource is included in the Directory of Properties in the Historic Property Data File (#015437). It has been designated a State Historic Landmark (#339 and #339-1), and was listed the National Register of Historic Places as an individual property in 1966.

The Jacques Gulch project area does not fall within the Historic District, and no cultural resources have been recorded within the project area.

3.5.5 Native American Consultation

A letter addressed to the Native American Heritage Commission (NAHC) was sent on April 27, 2006. It described the project and provided a map of the project area. The letter included a request for a listing of local, interested Native American representatives and information on traditional or sacred lands within the project area and vicinity. The NAHC sent a response on May 5, 2006, which stated that a "search of the sacred lands file has failed to indicate the presence of Native American cultural resources in the immediate project area." In July 2008, seven members of various tribes and groups that might have knowledge of Native American cultural resources or concerns at the project site were contacted by mail and telephone messages were left. No resources were identified.

100-foot buffer) until after the breeding period has ended but prior to the hibernation period (September through October). The second option would be to permit encroachment within the 100-foot buffer by construction activities, but under the supervision of a biological monitor. If the monitor observes bats leaving the roost site during construction activities, then all work near the tree will be halted and the appropriate buffer would be reinstated. The third option, exclusion of bats, should only be done as a last resort. Exclusion devices may include plastic flaps, screening or polypropylene netting of ¼-inch mesh or a short length of PVC pipe. Exclusion devices will be removed upon completion of construction activities.

Since raptors and other birds may potentially nest within the trees and shrubs that occur in and adjacent to the study area, there is a potential for construction-related impacts to nesting birds. Disturbance that results in the abandonment of an active nest is considered a significant impact. It is recommended that breeding season bird surveys be conducted prior to initial ground disturbance. If an active nest is observed, an exclusion buffer of 100 to 500 feet (depending on the species and location) around the nest is recommended until the birds have fledged.

Another approach would be to limit construction activities to the times of the year when birds are not breeding and bats are not roosting. Bird surveys will not be necessary if tree and shrub removal were to occur September through March, outside of the bird breeding season. Bat surveys will not be necessary if snag and large tree removal or disturbance were to occur in September and October, after the bat breeding season and before the bat hibernation season.

The stick houses of the San Francisco dusky-footed woodrat have been detected in the study area. If possible, these houses should be flagged and avoided during construction activities. If disturbance of the stick houses is unavoidable, clearing and construction near the houses should be postponed until young have left the nest. The availability of suitably sized sticks may limit the number of woodrat houses. Sticks from the dismantled house should be kept on site, near the dismantled house if possible.

Aquatic Species

No sensitive fish species are expected to occur in Site A and B. Construction Best Management Practices (BMPs) are expected to provide protection to any sensitive fish species that may be affected downstream of the proposed project in the Guadalupe Watershed.

Herpetofauna

No sensitive herpetofauna species were detected during site surveys. The project will include precautions to ensure those sensitive reptiles and amphibians with the potential to occur in the study area, as well as common herpetofauna species, are not harmed or harassed during construction related activities. Preconstruction and cursory surveys would be done to detect sensitive herpetofauna. An exclusion fence should be erected around the perimeter of the construction area to prevent species from entering the construction site. In addition, a construction monitor should be present during construction activities to salvage any wildlife species uncovered during excavation.

3.3.4 Planting Program

The objective of the planting program is to establish woody plants in the areas disturbed by calcine removal that will develop in response to site conditions over time into mature riparian vegetation. Planting is proposed to speed revegetation and to more quickly develop a diverse plant community. Under natural conditions, establishment of riparian trees would occur only occasionally when vari-

Chapter 4. Identification and Evaluation of Conceptual Alternatives

4.1 Background

Calcine in Jacques Gulch continues to be a source of mercury to downstream locations and the area of Jacques Gulch inundated by calcine no longer functions as a natural riparian habitat. The goals and objectives of the project are to eliminate the Jacques Gulch area as a source of mercury-bearing sediment and to restore natural physical processes and riparian habitat in the project area. Success will be measured by how well the project achieves both of these goals.

This chapter discusses the development of Conceptual Site Alternatives that have a high likelihood of achieving the project's goals. Conceptual Site Alternatives are alternatives specific to either Site A or B. Taking it to the next step, each Conceptual Project Alternative is made up of one Conceptual Site Alternative each for Site A and Site B.

4.2 Variables Considered

The Jacques Gulch Restoration Project will address specific needs. These include:

- Minimizing downstream transport of calcine through calcine removal, capping, or a combination of these methods
- Contouring the land surface and stream channel to create a geomorphically stable condition, then restore native vegetation and a riparian habitat
- Reducing sediment transport from Jacques Gulch into Almaden Reservoir
- Repairing and preventing road bank erosion at the intersection of Alamitos and Hicks Roads
- Optional: Replacing the existing culvert under Alamitos Road to Almaden Reservoir and providing a stable hydraulic outlet structure.

A number of designs could provide solutions for each of the separate needs. In addition to successfully addressing a specific need however, the various design elements need to work effectively together so as to not undermine the integrity or function of any other project element.

Factors considered when developing potential conceptual project alternatives are listed in Table 4-1. For each project element, variables to consider were identified. The variables and ranges were reviewed in light of the project objectives. Based on this review, some variables were determined to be not relevant, limited in applicability, or unlikely to meet project objectives in a reasonable way.

The prime motivators for the project are dictated by the Consent Decree, to which the District is a party. The Jacques Gulch Restoration Project is included in the decree, which calls for the removal or sequestering from the environment the calcine present at this location and for the restoration and enhancement of habitat in Jacques Gulch. Other project elements — culvert replacement, road bank restoration and protection, and sediment control — can be introduced into the alternatives once basic calcine and habitat issues are addressed. The information in Table 4-1 is organized to reflect the significance of calcine management and habitat creation as compared to other project elements.

Table 4-1. Factors Considered for Conceptual Site Alternatives

Project Elements	Variables Considered
Calcine	• All calcine removed • Some removed/some capped (wide range in %) • No removal, capping in place • Pattern of removal within sites (determined by geomorphology of stream, flood risk, contamination levels, Consent Decree requirements, etc.) • Different approaches for Site A as compared to Site B • Disposal at existing consolidation site in Almaden Quicksilver County Park • Disposal at a licensed landfill
Channel Restoration	• Geomorphic stability • Sinuosity/alignment, channel slopes, scour/deposition areas, local grade controls (e.g., bedrock outcrops), native (underlying) channel bed and terrace geometry, sediment transport characteristics, headcut instability. • Historical channel incision effects on design of equilibrium (i.e., stable) channel cross-section • Slope stability at various angles of repose • Capping, contouring strategies • Biotechnical bank stabilization of non-contaminated erosion hot spots • Restore channel reaches in current locations (Site A and Site B) • Realign lower end of Site A channel to north, to reduce erosive pressure on Hicks Rd embankment • Design secondary channel at upstream end of Site A to provide seasonal wetland habitat • Realign lower end of Site B channel to reduce east bank/hillslope instability
Site Restoration	• Vegetation requirements • Amount of mature tree removal • Use of "hardscape" protection at key points • Amount of vegetation saved • Relation between tree preservation and project objectives • Type and amount of native vegetation planted • Amount of different habitats created • Amount of wetland created (Note: while developing alternatives this criterion was deleted because of a concern that wetlands could facilitate methylization of mercury, with deleterious effects on wildlife.) • Optimization for specific animal species
Sediment Basin	• One basin at Alamitos Rd., Site A • No basin at Site A • Basis for basin sizing • Maintenance/cleanout access to basin • Temporary v. permanent basin
Erosion Control	• Stabilization methods • Relationship to stream flow, detention basin, and culvert placement
Culvert	• Type and size of culvert • Location relative to current culvert; new County intersection design requirements. • Integration with stream restoration and energy dissipater aspects • Passage (human & animal) limitation • Handling of debris • Materials used • Extent of installation • Low flow/high flow design requirements
Site Access and Haul Routes	• Route to Mine Hill • Route to alternate landfill • Effects on park users and traffic • Effects on New Almaden community • Vegetation impacts from access construction • Impacts on Jacques Gulch main stem crossing (Site B)

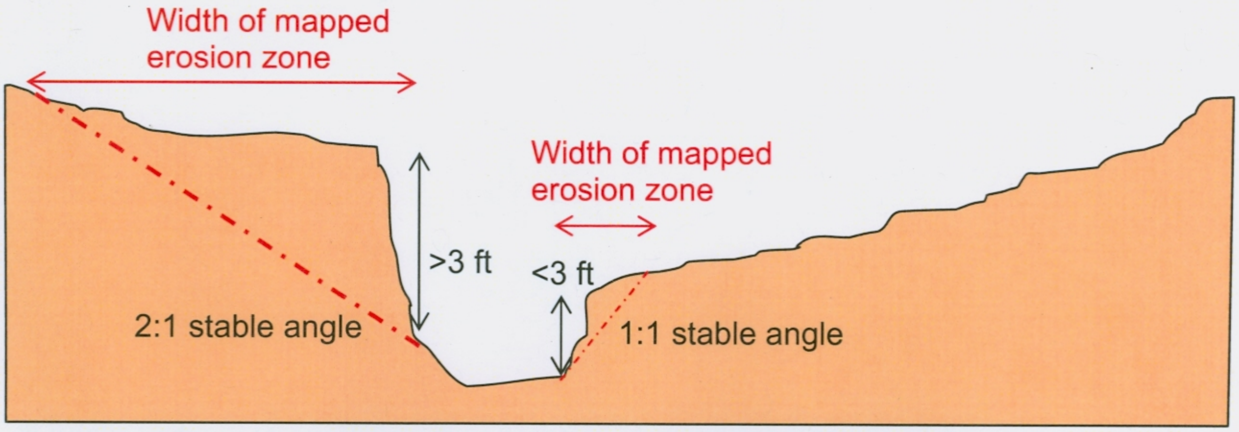
Theoretically, the number of project elements and the number of variables could result in an unworkably large number of potential alternatives — combining all variables with all other variables in a wide assortment of pairings. While the range of possible alternatives appears extremely broad, key project elements are constrained by conditions on the ground. For instance, the Consent Decree calls for restoring the stream corridor so it becomes a naturally functioning habitat similar to what would have been found here before calcine deposition. To properly restore the stream corridor so that it maintains itself over time, the restoration must exhibit geomorphic stability. To achieve stability, streamside slopes must be cut back to an angle that ensures long-term success. See Figures 4-1 and 4-2. In the upper project site, Site B, the drainage channel through the project is narrow and abuts steep canyon slopes over much of its length. This constrains how slope stability can be achieved. Given the narrow channels and floodplains comprising the two project sites, the requirement for slope stability dictates that the existing calcine deposits need to be removed from all but a few locations to achieve stability needed to maintain the long-term integrity of the project. Areas for potential in-place capping of calcine are found only where the valley floor is somewhat broader and flatter than the rest of the project area, and where stream and slope stability can be achieved without removing all calcine. Thus, despite a theoretically wide range of alternatives for how and where to consider capping the calcine, other project requirements intervene and greatly narrow the options.

Based on a review of the factors identified in Table 4-1, a range of potential project element variations was identified to represent a cross-section of possible outcomes focused on the general characteristics of Site A or Site B. Each element and its potential variations were considered by the District with regard to geomorphic stability, impact to listed and non-listed species, extent and potential value of new habitat, management of sediment and initial and long-term cost. The elements and their variations are summarized in Table 4-2.

Table 4-2. Potential Project Elements and Their Variations

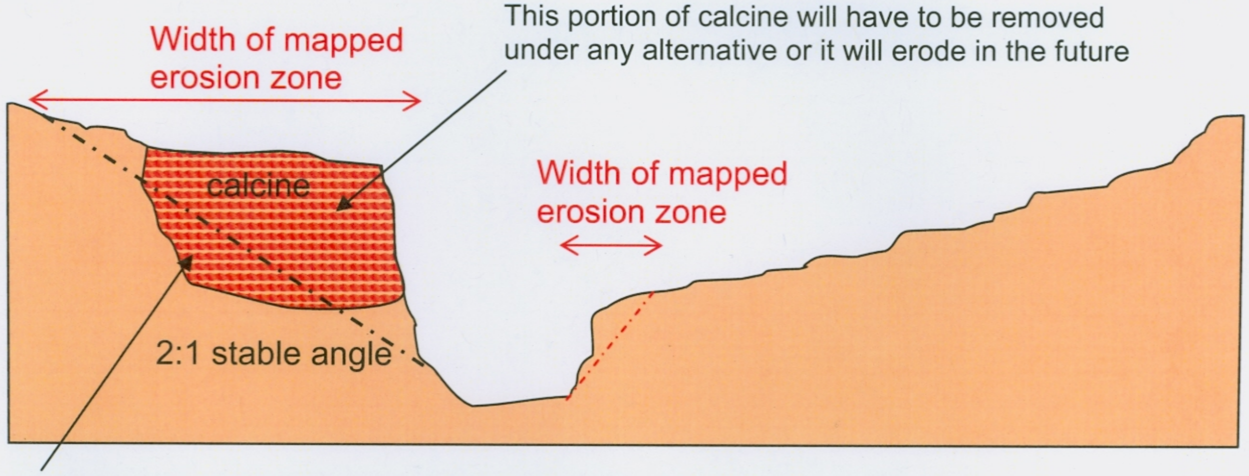
Site	Project Element	No.	Element Variation
A	Sediment Retention Basin	1A	No detention basin
		2A	Temporary basin, then retire
		3A	Permanently maintained basin
	Hicks Road Eroding Embankment	4A	Rebuild at 1.5h:1v
		5A	Rebuild at 3h:1v & realign channel north
	Secondary Overflow Channel	6A	Maintain channel in current location
		7A	Construct overflow channel at 1.5 yr. flow level
		8A	Realign channel to outside bend (overflow)
	Calcine Removal	9A	Remove all visible calcine
		10A	Remove 50% of calcine, armor channel, and cap remainder
	Alamitos Road Culvert	11A	Retain existing culvert, install energy dissipation
		12A	Replace existing culvert with new culvert and energy dissipation
B	Calcine Removal – floodplain	1B	Remove all visible calcine
		2B	Remove 50% of calcine, armor channel, and cap remainder
	Calcine Removal – upstream reach	3B	Remove all visible calcine
		4B	Remove 50% of calcine, armor channel, and cap remainder
	Downstream Channel Alignment and Bank Stability	5B	Leave channel in current location and construct drop structures to stabilize knick points
		6B	Leave channel in current location, construct drop structures to stabilize knick points, and regrade eroding banks
		7B	Realign channel onto center of floodplain and construct drop structure
		8B	Realign channel away from hillslope and stabilize large eroding bends

Figure 4-1. Cross-Section Showing Slope Stability Considerations



If eroded portion of bank is less than 3 ft high, erosion zone width = bank height
If eroded portion of bank is more than 3 ft high, erosion zone width = 2 x bank height

Figure 4-2. Cross-Section of Stream Channel Showing Stable Slope Related to Calcine Deposit



This portion of calcine will have to be removed under any alternative or it will erode in the future

This portion of calcine can be either excavated under a removal alternative or stabilized under a capping alternative

4.3 Project Elements Common to All Conceptual Site Alternatives

After reviewing the list of potential project element variations, it became clear that a number of project elements had either limited opportunity to vary or were essential to project success. Thus, a number of project elements were recognized as being common to all conceptual alternatives. These are discussed below.

Removal of All Visible Calcine. Due to the favorable relative costs of removal and disposal of all visible calcine as compared to in-place stabilization and capping of the calcine, full removal of all visible calcine within Sites A and B was determined to be a project element common to all Conceptual Site Alternatives. In most instances, particularly in the middle and upper reaches of the Site B channel, capping and stabilizing any portion of the calcine deposits was deemed technically infeasible due to the thickness and instability of the calcine deposits and the confining nature of the canyon sidewalls. Where capping was physically possible (e.g., along the broader channel floodplains), equipment access for removing calcine was easiest. Since ample space is available at the Mine Hill consolidation area to accommodate the entire volume of identified calcine deposits, this primary aspect of the Consent Decree was deemed fully realizable.

Hicks Road Embankment Repair and Protection. Located at the extreme downstream portion of the Site A, the Hicks Road embankment repair is largely independent of most design considerations for the larger project. As there is available room, it was decided that the design of the Hicks Road embankment repair would use a 3h:1v slope vs. a steeper slope. It was further decided that the design should incorporate willow or cottonwood post plantings.

Sediment Retention Basin at Site A. Site A has a broad area adjacent to the Jacques Gulch stream channel immediately upstream of Alamitos Road. This area is suitable for construction of a basin designed to trap sediment. Because the project would entail extensive excavation and grading and reestablishment of vegetation, it was decided to incorporate a basin to trap sediment. Further, it was concluded that a temporary sediment basin would be preferable to a permanent basin that would require removal of accumulated sediments every other year or so. This would preclude vegetation being established in the footprint of the basin. The temporary basin would trap sediments after construction was complete while vegetation became established. Eventually it would fill in. The basin would be planted with willow that could adapt to the accumulating sediments and the basin would be left to evolve over time.

4.4 Conceptual Site Alternatives Identified

During the review and evaluation of the potential project elements and their variations, and in comparing them to project objectives, the number of potential project elements narrowed, as discussed above. One additional element was eliminated from further consideration, realigning the channel at Site A from its current location to the overflow channel alignment near Hicks Road. It was determined that leaving the stream in its current alignment would be preferable to relocating the stream because it would allow more opportunity for enhancing habitat values in the area occupied by the existing (buried) overflow channel.

From this process, four Conceptual Site Alternatives were defined for Site A and three were defined for Site B. When taken in combination (one Conceptual Site Alternative for each site), these define a total of 12 Conceptual Project Alternatives. Table 4-3 presents the alternatives for each site.

Table 4-3. Conceptual Site Alternatives

Alternative	Overflow Channel – Site A	Culvert – Site A	Channel Location – Site B
A1	No overflow channel developed	No culvert replacement	—
A2	No overflow channel developed	New culvert	—
A3	Overflow channel developed	No culvert replacement	—
A4	Overflow channel developed	New culvert	—
B1	—	—	Lower reach restored to current location on edge of hillslope
B2	—	—	Lower reach realigned to address severely eroding hillslope locations
B3	—	—	Lower reach realigned more centrally on floodplain, away from hillslope

Each of the Conceptual Site Alternatives would:

- Undertake removal of all visible calcine and restore the project area
- *In Site A, provide a sediment basin capable of retaining a 2-year sediment yield from the watershed.*
- Provide temporary access for construction.
- Use a haul route to the consolidation area at San Francisco Cut in Almaden Quicksilver County Park via Hicks Road to the Hicks/Wood Road Park entrance then along the unimproved Wood Road uphill to the approved consolidation site at San Francisco Cut located on Mine Hill. Empty trucks would complete the circuit by returning down Wood Road and back to the construction site.

The majority of construction activities for each alternative would be associated with excavation of approximately 13,000 to 15,000 cubic yards of material, and regrading and revegetating the project sites once the material is removed. Construction is scheduled to take approximately six months. The District would carry out these activities consistent with District's Best Management Practices and any mitigation measures specified in the IS/MND.

The Conceptual Site Alternatives are discussed below for each site.

Conceptual Site Alternative A1. Visible calcine would be removed and the land graded to a stable surface. Removed calcine would be hauled to an existing consolidation site on Mine Hill.

The main stream channel would be restored to include somewhat more sinuosity than is currently found and be realigned where it enters the culvert under Alamitos Road. The channel would be graded to transport water and sediment without excessive scour or sediment deposition.

A temporary sediment basin would be developed at the lower reach of Site A, near Alamitos Road. This would be developed at the beginning of construction and left in place after construction. It would serve as part of the erosion and sediment control for the project immediately after construction, while site vegetation was being established. The basin would be sized to retain twice the projected annual sediment yield from the drainage.

The existing culvert crossing under Alamitos Road would be left in place (i.e., not replaced), but *a stone energy dissipater would be installed below the culvert outfall.*

An eroded road embankment below Hicks Road at its intersection with Alamitos Road would be restored and protected against future erosion. The restoration would restore the road edge and result in a 3:1 slope between the road and an alluvial flood terrace. The slope would be protected with natural materials against stream scour. The existing stream centerline/thalweg will be realigned away from the road to reduce future erosion to the road embankment.

Following construction at Site A, the disturbed area would be vegetated. The vegetation would be consistent with similar drainages in the area, and would include riparian plant species along the drainage and upland species at higher elevations. The vegetation would be maintained until established.

Hauling of excavated calcine to the consolidation area would be undertaken in consultation with the appropriate departments of the County of Santa Clara. A haul route between the project site and the consolidation site on Mine Hill has been identified. Laden trucks would travel from the Jacques Gulch project area northwest along Hicks Road to the Hicks/Wood Road entrance to Almaden Quicksilver County Park. From there, trucks would enter the Park and follow unimproved Wood Road uphill to the approved consolidation site at San Francisco Cut located on Mine Hill. Empty trucks would complete the circuit by returning down Wood Road and back to the construction site.

The consolidation location is a previous surface mined site that that subsequently has been approved for use as a site for consolidating calcine in the Park. Calcine from other areas in the park has been deposited and capped at this approved site previously. The site would be opened to receive the Jacques Gulch material. The new material would be graded and compacted; the site would be recapped and runoff control would be reestablished to prevent erosion of its surface and to reduce infiltration. After completion, the County would monitor the site as required by the Department of Toxic Substances Control (DTSC).

Conceptual Site Alternative A2. This alternative would be similar to Conceptual Site Alternative A1 except, subsequent to discussions and an agreement with the County, the existing culvert crossing under Alamitos Road, consisting of three corrugated metal pipes, may be replaced with a culvert meeting County standards. On the upstream side of Alamitos Road the bank and road edge would be restored and protected against erosion. On the downstream side of the road, the bank and road edge would be restored and protected and a stone energy dissipater installed below the culvert outfall.

Conceptual Site Alternative A3. This alternative would be similar to Conceptual Site Alternative A1, except the restoration would be done so as to allow a secondary overflow channel to form during high flows. This secondary channel would be located between the current channel alignment and Hicks Road, where the more constrained upper portion of the Site A channel transitions to its less constrained downstream reach. The existing culvert crossing under Alamitos Road would be left in place and not replaced.

Conceptual Site Alternative A4. This alternative would be similar to Conceptual Site Alternative A1, except the restoration would be done so as to allow a secondary overflow channel to form during high flows. This secondary channel would be located between the current channel alignment and Hicks Road, where the more constrained upper portion of the Site A channel transitions to its less constrained downstream reach. In addition, subsequent to discussions and an agreement with the County, the existing culvert crossing under Alamitos Road, consisting of three corrugated metal pipes, may be replaced with a culvert meeting County standards. On the upstream side of Alamitos Road the bank and road edge would be restored and protected against erosion. On the downstream side of the road, the bank and road edge would be restored and protected and a stone energy dissipater installed below the culvert outfall.

Conceptual Site Alternative B1. At Site B, all visible calcine would be removed and the land graded to achieve surface stability. Removed calcine would be hauled to an existing consolidation site on Mine Hill.

In the topographically constrained upper reach of Site B the stream channel would be restored in its current alignment. The stream channel in the lower reach of Site B would be restored in its current alignment along the eastern hillslope. Existing eroding banks and hillslopes would be graded to a stable slope and protected against channel erosion using biotechnical measures. The channel would be graded to create a stable channel and floodplain topography best suited to transport water and sediment without excessive scour or sediment deposition. As needed, low-level structures of stone would be installed in the stream bed to prevent excessive erosion of the channel. Biotechnical materials would be installed as needed to reduce bank erosion and maintain the channel's alignment.

Following construction at Site B, the disturbed area would be vegetated. The vegetation would be consistent with similar drainages in the area, and would include riparian plant species along the drainage and upland species at higher elevations. The vegetation would be maintained until established.

Hauling and consolidation of calcine would be the same as described for the Conceptual Site Alternatives for Site A.

Conceptual Site Alternative B2. This alternative would be similar to Conceptual Site Alternative B1, except in the wider lower reach of Site B, the current stream channel alignment would be adjusted away from the hillslope where eroding conditions exist.

Conceptual Site Alternative B3. This alternative would be similar to Conceptual Site Alternative B1, except in the wider lower reach of Site B, the channel would be realigned and located more centrally in the floodplain to avoid eroding nearby hillslopes.

4.5 Design Criteria for Project Elements

The Conceptual Site Alternatives are comprised of various project elements. Some are common to all alternatives as discussed above. Additional project elements are described below and the criteria to be applied in their design are presented in Table 4-4.

4.5.1 Description of Project Elements

Floodplain regrading (Sites A and B). Calcine occupies former floodplains in Jacques Gulch, and due to its cohesive nature has not eroded as natural sediment would have. By removing the calcine and producing floodplains at approximately the 2-year flood elevation, the project will restore natural geomorphic and biological functions. Floodplains will be cleared of calcine and leveled to the original pre-calcine surface. To overcome the effects of compaction, the native soils will be scarified, and native plants established. Erosion control measures such as mulching and seeding will be used to provide protection until plants become established.

Large woody debris structures (LWD) (Sites A and B). LWD will be used in several locations to train flows away from potential eroding banks, and to increase channel complexity and habitat value. LWD will be used in Site A to deflect flows away from the edges of the sediment retention basin and Hicks Road. In Site B log weirs will be used to direct flow through the beds of the new floodplain channel, away from the eroding hillslopes. Log structures will be constructed where possible without artificial anchors (e.g., steel cables), by keying logs into trenches and backfilling with soil and gravel, and using rocks.

Table 4-4. Design Features and Design Criteria

Design Features	Design Criteria
Calcine Removal	Remove extent of visible calcine (note 1)
Vegetated Boulder Revetment	2-foot minimum diameter boulders, interplanted with willow cuttings or posts
Culvert	20-year flow rate with 1 ft. of freeboard at roadway grade HS20 loading Reinforced concrete pipe
Culvert Inlet/Outlet Riprap	20-year flow rate, 2-ft. min. diameter boulders; rock voids filled with soil and seeded
Step Pool	Site A: Retention basin inlet – 2-year flow rate, with 2 ft. min. diameter boulders;
Log/Root Wad	Tree species native to locale with min. trunk diameter of 1.0 ft and trunk length (excluding root bole) of 12 feet. Use trees removed during calcine excavation wherever practicable.
Realigned Low-Flow Channel	Site A: 2-year flow rate ; channel slope w/existing culvert is 1.8%, with new culvert is 2.0% Site B: 2-year flow rate; channel slope to match existing conditions (based on reference reach) All natural channels designed with Manning's *n* of approximately 0.035
Overflow Channel	Overflow from main channel begins when flow is greater than 5-year flow rate
Native Material Revetment	Constructed of rootwads/logs and counterweight boulders, alluvial backfill, and willow post plantings; upper bank revegetated with native grass, shrubs, and tree seedlings.
Willow Wall Revetment	Constructed of keyed willow posts (2-3 in. diameter) 3 ft. on-center and woven willow branches, backfilled with channel alluvium and willow brush
Rock Toe Protection	5-year flow rate, boulder diameter to be calculated
Graded Slopes	3h:1v slope maximum at 85% compaction to accommodate revegetation with native species; distributed straw applied to graded and seeded slope for surface erosion control
Revetment Subgrade Key	3 feet minimum depth
Brush Mat with Rock Toe Protection	Brush mat 3h:1v max slope; rock toe 5-year flow rate
Vegetated Soil Lifts (VSL)	2:1 min slope
Sediment Basin	2 years of annual sediment yield
Plants – Riparian	Site A: alder, sycamore, willow, mulefat from on-site or watershed pole cuttings Site B: sycamore, from on-site or watershed pole cuttings, valley oak, coyote brush from on-site or watershed propagules
Plants – Upland	Blue oak, coast live oak, buckeye from on-site or watershed propagules

[1] Horizontal limits of calcine deposits were established visually; the vertical extent of calcine deposits was approximated using 19 borings and 9 test pits.

Boulder step pool structures (Sites A and B). Several reaches of the project site have incising channel beds due to channel confinement, and other reaches may be affected by the presence of the sediment retention basin. To prevent channel incision and promote natural channel function a series of boulder step pool structures will be installed. Two types of structure are planned for steeper and lower gradient reaches. In the high gradient reaches the structures will function to reinforce existing steps in the channel profile, to increase their stability where channel incision would threaten the stability of bank stabilization measures. These structures will not involve extensive disturbance of the channel, which already has a high degree of control from existing boulders. Additional boulders will be included at plunge pools and worked around exposed tree roots to impart greater stability without undercutting banks by keying in the structures. In the lower gradient reaches the structures will be placed in alluvium rather than boulders, and more formal boulder and cobble structures will be used that are keyed into the banks and bed. In Site B the steps will be used to restore the channel bed in the location of the four foot headcut, preventing incision of the channel. These will consist of appropriately sized rocks (sizing to be confirmed using hydraulic calculations).

Biotechnical bank stabilization (Sites A and B). The eroding bank at Hicks Road, as well as the vertical channel banks at the lower end of Site B will be stabilized using biotechnical methods. At Hicks Road, the slope will be reconstructed at a stable angle (3:1) using clean fill protected by vegetated rock on the bank toe and live plantings on the upper bank portion. The banks in Reach B1 will be cut to a stable angle (3:1) and protected by planted toe rock, with live plantings on the upper bank.

Replacement culvert (Site A). A replacement culvert will be installed under Alamitos Road to increase the capacity of the system from approximately a 5-year frequency flood to a 20-year frequency flood. A new vegetated rock energy dissipater will be constructed on the downstream end of the culvert to prevent undercutting of the embankment, and vegetated rock will be placed on the upstream side of the embankment to provide erosion control.

Secondary channel (Site A). Calcine occupies a former channel meander and pool in Site A (Reach A2). Restoration of the meander course would endanger the stability of the slope below Hicks Road. To prevent erosion while maximizing habitat values a secondary flow channel in the former meander course will be developed, with a channel elevation several feet above the original thalweg and two feet above the main channel. The channel will be activated during flows that occur approximately every two years, creating wet conditions and reducing erosion potential elsewhere in the channel.

Gully head stabilization (Site A). In Site A there are several gullies that could migrate headwards, triggering erosion and sedimentation in the Site B floodplain and sediment retention basin. These features will be stabilized using rock and log structures.

Sediment retention basin (Site A). A sediment retention basin will be excavated at the downstream end of the project site. The basin is sized to accommodate 2 years of estimated sediment accumulation. The basin will be excavated with side slopes of 3:1 to ensure geotechnical stability and minimize safety concerns. The upper and lower ends of the basin will be protected by boulder step-pool structures to act as grade controls and prevent headward incision from migrating out of the basin to the channel upstream.

Hillslope toe protection (Site B). The small landslides in Site B will be partially protected by realigning the channel away from the slopes and placing vegetated rock toe protection in the former channel site. This will remove the main source of active bank basal undercutting, increasing slope stability. However, these slopes are over steepened and are likely to erode or fail until they have reached a more stable angle. Reconstruction of the banks was considered, but the confined valley sides do not allow regrading to a stable angle. The proposed action should slow, but not stop, erosion.

Realigned channel (Site B). In Site B the downstream channel will be realigned away from an actively eroding bend and small landslide, and onto the newly restored floodplain. The alignment has been designed to avoid cutting the root balls of two mature oak trees, while still benefiting from their canopy and shade. The new channel will be constructed at the same elevation as the existing channel, and with similar dimensions to the reference reach (to be confirmed using hydraulic modeling). It will have a sinuosity similar to existing conditions. The channel alignment will be assisted by the presence of new large woody debris structures.

4.5.2 Design Criteria for Project Elements

Design criteria applicable to the various project features are summarized in Table 4-4. While the design features may vary as to their location, their essential functions are the same under all Conceptual Site Alternatives. Not all design features, however, will be found in all Conceptual Site Alternatives.

4.5.3 Geotechnical Design Recommendations

A geotechnical engineering investigation for the project was conducted in 2005-06 (Northgate 2006). The investigation included conducting a geologic reconnaissance and undertaking borings and test pits to define the limits of calcine and to sample the calcine to determine mercury concentrations. In addition to field investigations, the geotechnical study reported on geologic hazards and provided design recommendations. The design recommendations address foundations, lateral earth pressures, seismic design parameters, site preparation and grading, cut and fill slopes, and pavement design. The design recommendations, along with figures showing the extent of visible calcine at Sites A and B, are included in Appendix A.

4.6 Screening Criteria and Identification of Alternatives

4.6.1 Conceptual Alternatives for the Project

Twelve Conceptual Project Alternatives were identified for the project. These are combinations of 4 Conceptual Site Alternatives for Site A and 3 Conceptual Site Alternatives for Site B, as summarized in Table 4-3. Two Conceptual Site Alternatives, one for Site A and one for Site B, constitute a single Conceptual Project Alternative.

4.6.2 Identification of Three Alternatives for Further Study

The twelve Conceptual Project Alternatives were compared to each other to identify those that excel at meeting all project objectives and perhaps provide additional value. Elements common to all alternatives could not be used to distinguish one alternative from another. The distinguishing characteristics among the alternatives are the elements that vary among them. There are three: the presence or absence of an overflow channel in Site A, keeping or replacing the existing culvert, and the location of the stream channel in Site B. Each of these has the potential to satisfy or exceed project objectives to differing degrees.

4.6.3 Evaluation and Comparison Criteria

Eight criteria were identified for the purposes of evaluating and comparing the Conceptual Project Alternatives. These criteria were based on basic primary and secondary project objectives. They include:

- Primary Objectives
    - Reduction of mercury loading to the watershed
    - Restoration of physical process in a natural system
    - Restoration of riparian habitat using native plants

- Secondary Objectives
    - Enhancement of habitat for special status species
    - Protection of existing infrastructure
    - Maintenance of existing flood conveyance capacity
    - Minimization of impacts on existing resources
    - Minimization of long-term operations and maintenance requirements

Table 4-5 summarizes the comparison of the Conceptual Project Alternatives to the objectives. Two of the objectives could not be used to distinguish among the alternatives. The removal of all visible calcine is presumed to reduce mercury loading equally among all alternatives; and the full restoration of the sites is presumed to provide equal enhancement of habitat for special status species. Six of the objectives could be satisfied by the Conceptual Project Alternatives to differing degrees. Therefore, these objectives provided the final screen.

Table 4-5. Evaluation and Comparison of Conceptual Project Alternatives

Objectives	A1	A2	A3	A4	B1	B2	B3
Primary:							
Reduce Mercury Loading	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Restore Physical Processes	Δ	Δ	ΔΔ	ΔΔ	Δ	ΔΔ	ΔΔΔ
Restore Riparian Habitat	Δ	Δ	ΔΔΔ	ΔΔΔ	Δ	ΔΔ	ΔΔΔ
Secondary:							
Enhance Habitat for Special Status Species	Δ	Δ	ΔΔ	ΔΔ	Δ	ΔΔ	ΔΔΔ
Protect Existing Infrastructure	Δ	ΔΔ	Δ	ΔΔ	O	O	O
Maintain Existing Flood Conveyance Capacity	Δ	ΔΔ	Δ	ΔΔ	Δ	Δ	Δ
Minimize Impacts on Existing Resources	Δ	O	Δ	O	Δ	Δ	Δ
Minimize long-term Operations and Maintenance Requirements	O	Δ	O	Δ	O	Δ	Δ
Alternative Ranking (Score)	4 (7)	3 (9)	2 (11)	1 (13)	3 (6)	2 (10)	1 (13)

Δ = Meets objective
ΔΔ = Meets objective and provides one additional benefit
ΔΔΔ = Meets object and provides more than one additional benefit
O = Neutral or negative change from existing conditions

4.6.4 Evaluation and Comparison Results

Each of the 12 Conceptual Project Alternatives was considered a candidate to become one of three alternatives, which would undergo further evaluation. The three Alternatives with the greatest potential to successfully achieve the project's goal and objectives are derived from the highest ranking Conceptual Site Alternatives shown in Table 4-5 and are summarized as follows:

Alternative 1 (A4 & B3). The highest scoring combination of the Conceptual Site Alternatives for Sites A and Site B is A4 with B3. This pairing, creating Alternative 1, combines the best aspects of the alternatives from each of the two sites. In addition to the elements common to all alternatives, Alternative 1 provides for an overflow channel at Site A, and a new culvert (providing enhanced protection of infrastructure in the form of Alamitos Road and enhanced flood conveyance capacity). The lower elevation of the overflow channel relative to the water table would result in denser and more diverse vegetation. At Site B, Alternative 1 would place the channel in the lower reach of Site B producing more low-terrace riparian planting area. The additional riparian habitat would provide the greatest enhancement of habitat for wildlife, including breeding habitat for special status birds.

Alternative 2 (A3 & B3). Alternative 2 combines the best Site B conceptual alternative (B3) with the second-ranked Site A conceptual alternative (A3). It is similar to the Project Alternative 1, except it would not replace the culvert under Alamitos Road and would therefore not enhance flood conveyance capacity. When compared to alternatives that include the replacement of the culvert, more frequent overtopping of Alamitos Road during high-flow events would occur with this alternative. Alternative 2 includes the Site A overflow channel and the Site B placement of the channel more centrally in the floodplain, thereby achieving the same habitat enhancement values as Alternative 1.

Alternative 3 (A4 & B2). This alternative combines the best Site A conceptual alternative (A4) with the second-ranked Site B conceptual alternative (B2). Alternative 3 is similar to Alternative 1 except it places the channel at Site B nearer the existing alignment and would, therefore, have less potential for enhancement of riparian habitat in Site B. Also, there would be a slight increase in the risk of hillslope erosion as compared to Alternatives 1 and 2, each of which would have the Site B channel located more centrally in the floodplain. At Site A, Alternative 3 would replace the culvert under Alamitos Road and provide an overflow channel. Infrastructure protection and flood conveyance benefits with Alternative 3 would be the same as with Alternative 1, however, habitat enhancement benefits would be somewhat less than with Alternatives 1 and 2.

Chapter 5. Evaluation of Alternatives and Recommended Project

5.1 Alternatives Considered

5.1.1 Alternatives Considered and Rejected

The No Project Alternative was considered but rejected. Under the legally binding Consent Decree a restoration project must be undertaken. If the No Project Alternative were adopted, there would be no calcine removal and no site restoration. Existing conditions would persist, including the transport downstream of sediment eroded from calcine deposits. The Consent Decree would be violated and legal sanctions would be imposed.

Alternatives at offsite locations were considered but rejected as well. The Consent Decree is specific to the project sites. They are in Jacques Gulch at the locations identified as Sites A and B. Undertaking any alternative project at an offsite location would not address conditions at the Jacques Gulch sites, would not satisfy the goals and objectives of the project, and would be in violation of the Consent Decree.

A number of on-site alternatives were considered but rejected. These had to do with alternative ways of addressing project elements. The most fundamental was the strategy for dealing with calcine. The Consent Decree and the subsequent Restoration Plan leave open the option of removing less than the entire amount of calcine, as long as it is sequestered from the environment. Therefore, in addition to removing all visible calcine, options included removing various amounts of the calcine while capping and protecting the balance of the calcine at the site. When it was determined that it was feasible to remove all visible calcine, which was the strategy favored by the Trustees, alternatives that included partial removal and partial capping were rejected.

Historically, Jacques Gulch has contributed sediment to Almaden Reservoir. Currently, there is no sediment basin on the channel to trap sediment before it enters the reservoir. Three treatments for sediment were considered: no sediment basin, a temporary sediment basin that would be abandoned, and a maintained sediment basin. With removal of the calcine and restoration of the riparian landscape, it is believed that the quality of sediment from the drainage would be improved. Revegetating the streamside would likely trap an unknown amount of sediment. Therefore, it is possible sediment loads would decrease somewhat and be of better quality with project implementation. Because there is a benefit derived from having a sediment basin, the no sediment basin alternative was rejected. A maintained sediment basin would require regular maintenance and vehicle access. Permanent site access would need to be installed and maintained. A work area from which a backhoe or similar excavation equipment would operate would need to be installed permanently. This would reduce the area available for habitat restoration. Periodic cleaning of the basin would remove sediment but also prevent the establishment of riparian vegetation. Given the flow rates in Jacques Gulch, an effective basin would have to cover most of the lower portion of Site A. A maintained sediment basin would be less than optimal in terms of habitat restoration. For these reasons, a maintained sediment basin was considered but rejected. A temporary basin designed to hold two years of sediment was retained as a project element common to all alternatives. The basin would serve as part of the erosion control immediately following construction, when the restored vegetation is being established but not yet matured.

From the project area there are two alternative routes for hauling excavated calcine to the consolidation site at Mine Hill. These result in a total of four haul scenarios. One scenario would be to travel along Alamitos Road and Almaden Road to the Hacienda Furnace Yard entrance to the

Park. This entrance is immediately adjacent to the community of New Almaden. From the entrance, trucks would travel to the top of the hill via unimproved Mine Hill Road. Empty trucks would descend the hill via unimproved Wood Road, exit the park at the Hicks/Wood park entrance, and return via Hicks Road to the project site, thereby completing a circular route. A second scenario would be to travel in the opposite direction of the first scenario, using the Hicks/Wood park entrance and exiting at Hacienda Furnace Yard. These would both be circular routes. A third scenario would follow the Alamitos Road/Hacienda Furnace Yard Entrance/Mine Hill Road route to the top of Mine Hill, but then reverse the route on the return trip rather than using Wood Road to Hicks Road. The fourth scenario would be the mirror image of this, using the Hicks Road/Hicks-Wood Entrance/Wood Road route to the top of Mine Hill, then returning via the same route, rather than continuing down Mine Hill Road and Alamitos Road. All except the last of these alternatives were rejected. All of the rejected routes would use Mine Hill Road within the Park, pass through the Hacienda Furnace Yard entrance next to the community of New Almaden, and pass along Alamitos Road. The County identified Mine Hill Road as a popular hiking, biking, and equestrian route. Curves in the road would result in safety hazards for uses if trucks were also on the road. As a consequence, the road would have to be closed to users. This would be an unacceptable situation to the County. The use of Wood Road provides a preferred alternative. Also, the Hicks Road/Wood Road alternative keeps trucks away from New Almaden and would pass no residences between the project site and the top of Mine Hill. Therefore, all but the Hicks/Wood route to Mine Hill were rejected.

5.1.2 Alternatives Studied in More Detail

Chapter 4 identified three Alternatives to be studied in more detail. These are:

Alternative 1. At Site A, all visible calcine would be removed and the land graded and contoured to provide appropriate slope stability and floodplain function. The main stream channel would be restored in its current alignment. The channel would be graded to create the channel and floodplain topography best suited to transport water and sediment without excessive scour or sediment deposition. The restoration would be done so as to allow a secondary overflow channel to form during high flows. This secondary channel would be located between the current channel alignment and Hicks Road, where the more constrained upper portion of the Site A channel transitions to its less constrained downstream reach.

A temporary sediment retention basin would be developed at the lower reach of the Site A, near Alamitos Road. It would serve as part of the erosion and sediment control for the project immediately after construction, while site vegetation was being established. The basin would be sized to retain twice the projected annual sediment yield from the drainage.

An eroded road embankment below Hicks Road at its intersection with Alamitos Road would be restored and protected against future erosion. The restoration would restore the road edge and result in a 3:1 slope between the road and an alluvial flood terrace. The slope would be protected against stream scour to the 10-year flood stage with natural materials.

The existing culvert crossing under Alamitos Road consists of three corrugated metal pipes and would be replaced with a culvert meeting County standards. On the upstream side, the bank and road edge of Alamitos Road would be restored and protected against erosion. On the downstream side, the bank and road edge would be restored and protected and a stone energy dissipater installed below the culvert outfall.

Following construction at Site A, the disturbed area would be vegetated. The vegetation would be consistent with that of similar drainages in the area, and would include riparian plant species along the drainage and upland species at higher elevations. The vegetation would be maintained until established.

At Site B, all visible calcine would be removed and the land graded and contoured to provide appropriate slope stability and floodplain function. The stream channel would be restored in its current alignment in the topographically constrained upper reach of Site B. In the wider lower reach of Site B, the channel would be realigned and located more centrally in the floodplain to avoid eroding hillslopes. The channel would be graded to create the channel and floodplain topography best suited to transport water and sediment without excessive scour or sediment deposition. As needed, low-level structures of stone would be installed in the stream bed to prevent excessive erosion of the channel.

Following construction at Site B, the disturbed area would be vegetated. The vegetation would be consistent with that of similar drainages in the area, and would include riparian plant species along the drainage and upland species at higher elevations. The vegetation would be maintained until established.

Alternative 2. This Alternative would be similar to Alternative 1 except that the existing culvert crossing under Alamitos Road would be left in place and not replaced. A vegetated boulder energy dissipater would be installed at the outlet of the existing culverts.

Alternative 3. This Alternative would be similar to the Alternative 1 except that the stream channel would be realigned in the lower reach of Site B at key points where erosion is occurring along the toe of the hillslope. These eroding banks would be graded to a stable slope and protected against channel erosion using biotechnical measures. The channel realignment with this alternative is not as significant as with the Alternative 1. The channel would be realigned only to accommodate the slope regrading, and not to reestablish a channel more centrally in the floodplain.

5.2 Evaluation of Alternatives and Recommended Project

This section discusses the expected operating life, life-cycle costs and construction difficulties and compares the alternatives with regard to geomorphic, hydrologic and biological characteristics.

5.2.1 Expected Operating Life

The restoration elements that comprise each of the three alternatives would have an indefinite expected operating life. There is no distinction between the alternatives with regard to these elements. The restoration elements are designed to reintroduce and facilitate natural physical processes within the riparian corridor and to reestablish native plant communities and habitat. As such, both the physical and biological restoration elements can be expected to adjust and evolve over time, with the overall system remaining stable.

Alternatives 1 and 3 incorporate a new culvert crossing at Alamitos Road. Culvert crossings have a finite service life. It is assumed that the new reinforced concrete pipe (RCP) culvert would have a service life of 50 years.

Alternative 2 would retain the existing culvert crossing but would provide an energy dissipater at its outlet. It is not known how long the existing corrugated metal pipe(s) (CMP) culvert system has been in place. A reasonable life expectancy for CMP culverts is 25-35 years. Based on visual examination, it appears that the metal pipes may have a remaining service life of approximately 15 to 20 years. However, the service life of the system could be significantly shortened by flows overtopping the roadway and eroding the road embankment and fill around the culverts.

5.2.2 Life-Cycle Costs

Life cycle costs include:

- Initial capital costs
- Annual operation and maintenance costs
- Facility replacement costs

Initial Capital Costs. Initial capital costs include the cost to construct the restoration elements and the new culvert system, install and remove the temporary access roads, and conduct monitoring during the first five years of the operation of the system. There is little distinction between the capital costs of the alternatives with the exception of the cost of installing the culvert with Alternatives 1 and 3. The capital costs of the alternatives are included in Table 5-1. Appendix C provides cost estimate detail for the recommended project.

Table 5-1. Initial Capital Cost Summary for Sites A and B

Description	Initial Cost of Construction	Cost of 5-Year Monitoring	Total Initial Capital Cost
Alternative No. 1	$4.75 million	$0.15 million	$4.90 million
Alternative No. 2	$4.6 million	$0.15 million	$4.75 million
Alternative No. 3	$4.75 million	$0.15 million	$4.90 million

Annual operation and maintenance costs. It is not anticipated that the restoration elements of the project will require annual operation and maintenance. However, annual operation and maintenance (O&M) costs are anticipated for the culvert and energy dissipation system. To develop the estimated O&M cost of the culvert system, it was assumed that an annual inspection would be performed and that every other year, vegetation would be removed from the areas immediately upstream of the culvert inlet and downstream of its outlet. No other significant O&M costs are assumed. Annual inspection of the culvert and energy dissipation system is budgeted for one person and one vehicle for a period of 4 hours at a cost of $500 per year based on $125 per hour. Vegetation removal every other year is budgeted for two persons and one dump truck for one day. It is assumed that removal and loading of vegetation and debris would be by hand. The cost for labor is assumed to be $125 per hour per person and the cost for the dump truck is assumed to be $400 per day. Therefore, the estimated cost for removal and disposal of vegetation is $2,400, every other year. These costs would be applicable to all alternatives as the existing culvert system still needs to be maintained and operated. These costs are summarized in Table 5-2.

Table 5-2. Operation and Maintenance Cost Summary

Activity	Frequency	Estimated Cost
Culvert Inspection	Once per year	$500
Vegetation/Debris Removal	Once every other year	$2,400

Facility replacement costs. Facility replacement costs are presented in current dollars. Because the restoration elements are designed to restore physical processes, it is not anticipated that restoration elements will require replacement. However, the culvert and energy dissipation system have a finite life span which is assumed to be 50 years. The current dollar cost of the culvert system, not including contingencies, is estimated to be $100,000.

5.2.3 Construction Difficulties

Construction difficulties would be nearly identical for each alternative. The identified construction difficulties are:

- Traffic control during installation of the new culvert (applies to Alternatives 1 and 3 only)
- Temporary construction access
- A restrictive work corridor for calcine removal and channel restoration in Site B
- Calcine removal
- Restoration elements
- Establishment of new vegetation (no feasible means of irrigation)
- Dewatering during construction
- Health and safety

Traffic Control During Installation of the New Culvert. The project will require control of traffic during installation of the new culvert in Alamitos Road. The volume of traffic on the road is low. The existing road pavement measures approximately 32 feet in width with minimal shoulders and steep banks on either side. The culvert will need to be installed in two phases. The first phase would include reconstruction of the eastern side of the road embankment to establish a new embankment slope of 2H:1V. The new culvert would be constructed from its outlet to about the centerline of the existing road. To manage traffic, the existing road would be temporarily narrowed to a single lane with stop signs for each direction of traffic. The single lane road would measure not less than 14 feet in width. K-rails would be installed on each side of the temporary single lane road. With completion of the downstream segment of culvert the east side road surface would be reconstructed in preparation for switching the position of the temporary single lane to this side of the road. In the second phase the new culvert would be installed from approximately the centerline of the existing road upstream to the inlet of the new culvert. After installation of the culvert, the road would be reconstructed. The K-rails would be removed to restore two lanes of traffic.

Temporary Construction Access. A separate temporary construction access would be provided to Site A and Site B. The Site A access would be from Hicks Road approximately 150 feet west of its intersection with Alamitos Road. A temporary ramp would be constructed to facilitate the movement of dump truck traffic into and out of the site. A separate temporary access would be constructed for Site B that would extend from Hicks Road and cross the main stem of Jacques Gulch. The access road would be designed to facilitate dump truck movements into and out of the site.

Access to Site B would require the construction of a temporary access road extending from Hicks Road to Site B. Hicks Road is higher in elevation than Site B. The temporary road would begin approximately 1,500 feet north of the intersection of Hicks Road and Alamitos Road and would extend to the north and east. The temporary road would measure approximately 25 feet in width and the embankment would have side slopes of 1H:1V. The maximum slope of the road would be approximately 20 percent. At its intersection with Hicks Road, the temporary road would maintain a level profile to provide a flat area to facilitate safe entry and exit from Site B. The access route would be aligned in the field to minimize tree removal, consistent with the need for trucks and equipment to enter and exit the site safely. Fill material used to make the access road would be removed after construction. Any trees removed by access road construction would be replanted at a ratio determined during the preparation of the Mitigation Monitoring Plan.

Restrictive Work Corridor in Site B. The upper portion of Site B is located in a narrow canyon. The narrow bottom width of the canyon coupled with the steep side slopes will constrain machine movements during excavation and removal of the calcine. It may be necessary to handle excavated calcine multiple times prior to its ultimate deposition at the consolidation site.

Calcine Removal. Calcine contains mercury and potentially contains asbestos. OSHA 40-hour training may be required to perform excavation and hauling activities. Air monitoring may also be required during construction. It is highly recommended that a field construction engineer be on-site to observe calcine excavation activities and determine when excavation should cease. There is a limited amount of data available to assess the volume of calcine present at the site, which indicates that this project has the potential for claims for extra work and/or a claim for a substantial change in the quantity of work. Significantly more data points, based on a grid pattern, would be required to mitigate exposure to claims based on a substantial change in the quantity of work. The presence of a field engineer could mitigate the potential for claims due to over or under excavation. Costs associated with field engineering are included in the Additional Items section of the Cost Estimate included in Appendix C.

Restoration Elements. Many of the restoration elements shown on the plans are specialty items that are not easy to construct. The contractor should have prior experience in installation of the types of elements shown on the plans. In addition, it is highly recommended that a qualified field engineer be present during installation of the specialty restoration elements. Costs associated with field engineering are included in the Additional Items section of the Cost Estimate included in Appendix C.

Establishment of New Vegetation. There is no readily available water supply to provide irrigation water for new plantings. Rather than provide irrigation for new plantings, the project approach is to overplant and install replacement plantings as needed. Nonetheless, with completion of the calcine removal and creek restoration work, the Site B access road will be removed, making access to Site B difficult and requiring that manual labor perform all replacement planting activities. Access to Site A will be easier but there will be no access road after the initial project completion. Replacement planting in Site A will also require manual labor.

Dewatering During Construction. Groundwater may be encountered during excavation of the calcine, particularly in Site A in the overflow channel area (Sycamore area), where the geotechnical investigation encountered groundwater at approximately 8 feet below ground surface. Groundwater may also be encountered during excavation of the sediment basin and during restoration of the stream channel in the upper portion of site A and the lower portion of site B. A temporary drainage system may be required to direct stream flows around stream channel restoration work areas and pumping may be required in the Sycamore area to temporarily lower groundwater levels to facilitate calcine removal and backfill operations.

Health and Safety. The contractor selected to construct this project should prepare a project specific Health and Safety Plan (HSP) conforming to the requirements of CalOSHA and the California Department of Toxic Substances Control. Only 40-hour health and safety trained personnel should be allowed to perform the work of this project.

5.2.4 Comparison of Geomorphic, Hydraulic, Geotechnical and Biological Characteristics

Geomorphic Characteristics

From a geomorphic perspective Alternative 1 has the most desirable characteristics. The new culvert slightly reduces backwater effects in Site A, allowing a more natural channel form to develop and slightly reducing the risk of lateral channel migration. The secondary channel in Site A reduces erosion risk and increases channel complexity. Relocation of the channel in Site B should reduce bank erosion and lead to better channel-floodplain connectivity. Stabilization of the bank toes in the upper reaches of Site B should reduce erosion and sediment loading of the channel downstream.

Alternative 2 would have very similar geomorphic characteristics to Alternative 1, but the presence of the existing culvert would leave a slightly larger backwater effect at high flows, potentially encouraging aggradation and lateral channel migration near Hicks Road. Site B would be unchanged from Alternative 1.

Alternative 3 would have the same geomorphic characteristics as Alternative 1 in Site A, but would have less desirable characteristics in Site B. The channel in Site B would be left against an unstable hillslope (though with some additional toe protection). The channel would have less floodplain interaction and a less natural appearance due to the rock protection of the eroding bank.

Hydrologic and Hydraulic Characteristics

Sediment Management. There is no meaningful distinction between the three alternatives with regard to sediment management as each alternative incorporates a retention basin at Site A. The purpose of the retention basin is to trap and store sediment transported from the restoration areas during the first two years following the calcine removal and channel restoration. These construction operations will bare significant areas prior to the establishment of a rooted ground cover. While erosion control measures (Best Management Practices (BMPs)) will be employed to minimize raindrop impact and soil detachment and transport in runoff, some level of erosion in excess of background levels can be expected to occur within these areas. In addition, some minor calcine residues could exit the restored reaches after construction. The proposed sediment retention basin is intended to store coarse sediments during its brief period of service, including minor, unconsolidated calcine residues. Once the available sediment storage volume has been filled, the lower reach channel will be allowed to move toward a stable form and alignment. Due to the initial undefined nature of the developing channel, the process of stable channel formation could take a number of years. As the basin is a temporary BMP measure, there will be no sediment cleanout within the original excavated basin footprint. The sediment retention basin at the downstream end of Site A has a volume equivalent to twice the average annual sediment yield as discussed in Chapter 3, or 876 cubic yards. The basin is expected to operate as a sediment trap for approximately 2 years.

Culvert Replacement. From a hydraulic capacity perspective, the replacement of the existing culvert at Alamitos Road favors Alternatives 1 and 3 over Alternative 2. Based on analysis of the capacity of the existing culvert, it may be expected that Alamitos Road would be overtopped approximately once every 5 years. Overtopping flows have the potential to severely damage the road embankment and pavement and convey debris and sediment downstream. On the other hand, the new culvert system would be capable of safely passing the 20-year flood without overtopping Alamitos Road thus reducing the risks associated with overtopping flows.

Biological Characteristics

Alternative 1 provides for an overflow channel at Site A. The lower elevation of the overflow channel relative to the water table would result in denser and more diverse vegetation. At Site B, Alternative 1 would place the channel in the lower reach of Site B more centrally in the floodplain, producing more low-terrace riparian planting area. The additional riparian habitat would provide the greatest enhancement of habitat for wildlife, including breeding habitat for special status birds.

Alternative 2 would be the same as Alternative 1, except the culvert under Alamitos Road would be not be replaced. This would have no discernible effect on biological resources. Thus, Alternative 1 and Alternative 2 are similar with regard to biological benefits.

Alternative 3 would provide the same biological benefits at Site A as the other two alternatives. However, at the lower reach of Site B, Alternative 3 would realign the channel away from key points where erosion is occurring along the toe of the hillslope. This would not produce as much low-terrace riparian planting area as Alternative 1, where the channel is more central to the floodplain.

Geotechnical Characteristics

A geotechnical investigation was performed for the project. The findings of the geotechnical investigation are summarized in a report titled Geotechnical Engineering Investigation Jacques Gulch Restoration Project dated February 2006 (Northgate 2006). The objectives of the geotechnical investigation were to perform a geologic reconnaissance and mapping, investigate the site and subsurface conditions, perform appropriate geotechnical laboratory testing, evaluate the data, estimate the thickness and extent of mercury impacted materials and develop geotechnical recommendations and design criteria. Each of the alternatives would repair the eroded portion of Hicks Road. Alternatives 1 and 3 include replacement of the culvert under Alamitos Road. It is assumed that the project design will implement the recommendations in the geotechnical report. Therefore, from a geotechnical perspective, there would be no significant distinction between the alternatives.

5.2.5 Monitoring

It is anticipated that long-term monitoring of the restoration elements will not be required. However, the plant establishment should be periodically examined to evaluate performance for a period of three years following construction.

Plant Establishment

New plantings should be inspected and maintained for a period of three years following construction. Inspection should be performed by a qualified professional. Vegetation will be replaced as necessary to meet the performance criteria established in conjunction with regulatory agencies. Maintenance should include installation of tree baskets to protected sprouted acorns, weeding and replacement planting as called for by the biologist. No other long-term monitoring of channel stabilization or vegetation is anticipated.

5.2.6 Recommended Project

It is recommended that the District implement Alternative 1. This alternative combines the highest ranking Conceptual Site Alternative for Site A with the highest ranking Conceptual Site Alternative for Site B. From a geomorphic perspective, Alternative 1 has the most desirable characteristics because it includes the new culvert in Site A, which will encourage a more natural channel to develop, and includes a relocated channel in Site B which promotes better floodplain connectivity. From a biological perspective, Alternative 1 provides enhanced riparian terraces in Site B. Alternative 1 would increase the capacity of the existing culvert to safely convey the 20-year flood, thereby reducing the frequency of flows overtopping Alamitos Road and the resulting potential damage.

Drawings of Alternative 1, the Recommended Project, are provided in Appendix D. Appendix E includes drawings of the two alternatives to the project.

5.2.7 Consolidation Site

The Consent Decree requires that all visible calcine in the Jacques Gulch project sites be removed, consolidated, and capped at the Mine Hill area of the Almaden Quicksilver County Park, and/or trapped and/or stabilized in place. The Project proposes to remove all visible calcine and to consolidate and cap it.

The consolidation site at Mine Hill is located in an area known as the San Francisco Open Cut. The site is referred to as the Mine Hill consolidation area. It is approximately 750 feet northwest of the abandoned Mine Hill rotary furnace and mine buildings. This site has been used previously by Santa Clara County for consolidation of calcine from other restoration projects. The calcine fill material has been deposited, graded, compacted, capped, and drained in accordance with engineering drawing 5 of 16 prepared by the County and dated March 17, 1996. This design was approved by the California Department of Toxic Substances Control. The existing fill is capped with a layer approximately 2 feet thick. Except for sparse grass, there is little vegetation cover on the site. Existing fill slopes at the site vary from 3 to 1 on the lower section to 15 to 1 on the upper section. Concrete V-drains have been constructed across the consolidation area to intercept overland flow and prevent the formation of erosion rills.

Using a footprint that remains within the barren surface of the existing consolidation area and using maximum side slopes of 2.5 to 1, the total amount of material that can be contained on this site is estimated to be approximately 37,000 cubic yards. This quantity includes both calcine fill and capping materials. Following placement of fill, a 2-foot thick protective layer or cap would be placed over it to prevent water from penetrating into the fill. This cap represents a volume of approximately 7,000 cubic yards. This leaves a net potential volume of 30,000 cubic yards for the consolidation of calcine.

The District anticipates that the Jacques Gulch Restoration Project will generate 15,000 cubic yards of calcine, including a bulking factor allowance. Santa Clara County anticipates that its separate projects will generate 10,000 cubic yards of calcine. It is proposed to compact the calcine fill material to 85% relative compaction at the optimum moisture content. The combined volume of the Jacques Gulch project and the County projects is 25,000 cubic yards. With an available capacity of 30,000 cubic yards, this leaves an allowance of 5,000 cubic yards at the site to accommodate any volume change that may occur between excavating the calcine and compacting it at the Mine Hill consolidation site.

The existing fill site will require some preparation, such as tilling, key construction, footing and benching, before new calcine can be placed and compacted. The existing access road from Wood Road to the north end of the consolidation area will be cleared of vegetation that has grown since the road was last used. The lower edge of the proposed new fill area will require construction of a keyway prior to any fill being placed. An existing vent shaft for a mining tunnel beneath the site will be extended vertically to accommodate the additional fill height.

Calcine will be consolidated at the site by the District and the County in two separate phases. Phase one will occur as part of the District's Jacques Gulch Restoration Project. The project will result in fill being placed over the existing fill, from elevation 1630 up to approximately elevation 1675. During this operation, fill will be placed at a maximum slope of 2.5 to 1 and a 2-foot-thick cap will be placed on all side slopes. Benches and concrete drains will be constructed as shown on the drawings. The new concrete drains will be connected with the existing drainage system at the base of the fill area. The top surface of phase one will not be capped until after the second fill phase. To protect surrounding slopes, the perimeter of the open top area will be contained by a rolled erosion control product to prevent sediment from leaving the site.

Phase two is expected to occur 12 months after completion of phase one. During this second phase, Santa Clara County will complete the fill. This includes a 2-foot-thick cap placed on the side slopes and top of the phase two fill. Concrete drains will be constructed to connect with the drainage system of phase one.

A geotechnical investigation was performed confirming the stability of the proposed fill slopes for the two phases of construction along with recommendations for the proposed design for the fill operations including the keys, footings, compaction, and shrinkage.

5.3 Cost, Funding, and Schedule for Recommended Project

5.3.1 Cost

The estimated cost for the recommended project is $4.9 million. There are no anticipated right-of-way acquisition costs. Estimated quantities and order-of-magnitude costs for the recommended *project are provided in Appendix C.*

5.3.2 Funding

The recommended project would be funded by the District's Water Utility Enterprise Fund. Under the terms of a to-be-executed agreement with the County of Santa Clara (County), the County may reimburse the District an amount up to $140,000 for replacement of the County's existing culvert system beneath Alamitos Road.

5.3.3 Schedule

Advertising of the construction project is anticipated to occur in March 2009. Construction contract award is anticipated to occur in May 2009. Construction is anticipated to begin in June 2009 and last through the year.

Chapter 6. References

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Appendix A

GEOTECHNICAL REPORT CALCINE MAPS, BORING LOGS, AND RECOMMENDATIONS

Appendix A

From the Geotechnical Investigation Report prepared for the Santa Clara Valley Water District:

Northgate Environmental Management, Inc., July 2006. "Geotechnical Engineering Investigation: Jacques Gulch Restoration Project"

DESIGN RECOMMENDATIONS

Our geotechnical design recommendations are presented and discussed in the following sections.

Foundations

We recommend that if a box culvert is used, it be supported on a mat foundation bearing on the native sandy clay soil. At this depth, the following allowable bearing pressures are recommended:

Allowable Bearing Pressures for Mat Foundation Bearing on Native Sandy Clay	
Dead Load	2000 pounds per square foot
Dead plus Live Loads	3000 pounds per square foot
All loads	4000 pounds per square foot

The Civil Engineer/Structural Engineer should design the culvert to withstand the HS20 design loading assuming a 2-foot soil cover.

Footing concrete should be poured neat against undisturbed soil. Any existing fill or disturbed or softened material within the footing excavations should be removed to firm bearing material. Over-excavated areas should be backfilled with lean or structural concrete or compacted fill. Footing excavations should be kept moist before concrete placement.

If a reinforced concrete pipe culvert is used, we recommend that the pipe be bedded on a minimum of 6 inched of clean sand. The culvert backfill should meet the following specification:

Sieve Size	Percentage Passing
3-inch	100
No.4	35 to 100
No.30	20 to 100

The excavation should be backfilled to the crown of the pipe.

A cutoff wall is recommended upslope and downslope of culvert. The cutoff wall should extend a minimum of 3 feet into undisturbed native soil below the bottom of the culvert and 3 feet into the undisturbed excavation sidewalls. Care should be taken to verify that bedding and backfill is not present in the cutoff wall excavations at the time of the concrete pour.

The culvert empties into Almaden Reservoir. Currently there is a large scour feature at the end of the existing pipes. We recommend that the culvert designer design a concrete outlet structure to minimize scour and undermining of the new culvert.

A Geotechnical Engineer should review the foundation plans before issuing the construction bids, and observe all foundation excavations and inspect and approve all soil materials.

Lateral Earth Pressures

Lateral earth pressures are imposed on all earth-retaining structures. For cantilever retaining walls, which are free to deflect, an active earth pressure equivalent to a fluid having a density of 35 pounds per cubic foot (pcf) is recommended. This value assumes that imported granular fill will be used as retaining wall backfill. If native clay soils are used as backfill, a higher value will be required and a Geotechnical Engineer should be contacted for additional recommendations.

For restrained and drained conditions, such as the culvert walls with drainage, where deflection is not acceptable, an “at rest” condition would apply. Under this condition, the recommended backfill pressure for granular backfill is equivalent to a fluid with a density of 65 pcf. If the walls are not drained and hydrostatic pressures could exist behind the walls, an “at-rest,” undrained equivalent fluid pressure of 93 pcf is recommended.

These values presented above apply to horizontal backfill and do not include surcharge pressures that would be caused by load applied to the backfill. It is recommended that the surcharge pressures be accounted for by assuming a soil surcharge load equal to 2 feet of soil above the proposed ground surface. Where backfill is placed against structures, it is assumed that granular backfill be used in the zone equal to the wall height immediately adjacent to the structure.

We recommend that a dynamic active earth pressure increment, $K_{ae} = 0.26$, be applied at 2/3 of the wall height in addition to normal wall pressures to model dynamic loading. The dynamic earth pressure increment may be modeled using an inverted triangular pressure distribution as an equivalent fluid density of 65 pcf (though inverted).

Resistance to lateral loads is obtained from passive resistance on the opposite vertical face of the culvert. Friction coefficient of 0.3 on the bottom of the mat foundation may be included in the design.

Seismic Design Parameters

We recommend that the following seismic design parameters be incorporated in the project design:

CBC Site Categorization and Site Coefficients **Blake UBC Seismic, 1998**	
Categorization/Coefficient	**Design Value**
Soil Profile Type (Table 16-J)	Sc
Seismic Zone (Figure 16-2)	4
Seismic Zone Factor (Figure 16-I)	0.4
Seismic Source Name	San Andreas, Monte Vista
Seismic Source Type (Table 16-U)	A, B
Distance to Seismic Source (kilometers)	8.3, 1.4
Near Source Factor Na (Table 16-S)	1.3
Near Source Factor Nv (Table 16-T)	1.6
Seismic Coefficient Ca (Table 16-Q)	0.52
Seismic Coefficient Cv (Table 16-R)	0.90

Site Preparation and Grading

It is not anticipated that any site clearing will be required from a geotechnical engineering standpoint in Sites A and B, except in the erosion repair area. The calcine materials will be excavated using an excavator, loaded into trucks, and hauled from the Site. The materials will be taken to a designated disposal area, placed, and capped. In the erosion repair area, the site should be stripped of vegetation. The loose and disturbed materials should be excavated and stockpiled for reuse. The organic-rich soils should not be reused as engineered fill.

At the culvert Site clearing will include the removal of existing pavements and surface debris. It is expected that the work will be done in sections to maintain one-lane road access through the work area. The existing culvert pipes will be removed, and the Site will be excavated to the design grade. The excavated materials should be suitable for reuse in the erosion repair area but not in the culvert area since granular backfill is recommended for the culvert bedding and backfill.

Surfaces to receive fill should be scarified to a depth of 6 inches and recompacted. Scarification may be reduced or eliminated at the discretion of a Geotechnical Engineer based on field observations if such activities will not result in improvement due to the presence of cobbles, boulders or other rock-like materials. Fills should be compacted as recommended below:

- Structural fills (including fills beneath structures, beneath pavement, and engineered slopes) should be placed to a minimum 90 percent relative compaction (ASTM D1557) below a depth of 4 feet. From the pavement subgrade to a depth of 4 feet the structural fill should be compacted to 95 percent compaction. Structural fill should be brought to a moisture content of optimum percent to optimum plus three percent. Fills should be placed in uniform lifts of no more than 8-inch loose thickness. Only light, walk behind, or remote compaction equipment should be used within the zone of soil behind the wall equal to the soil height above the wall base. Overcompaction should be avoided because increased compactive effort can result in lateral pressures higher than those recommended in this report. In these areas where light equipment is used, it may be necessary to reduce the lift thickness to obtain the specified compaction.

All imported fill materials should be approved by a Geotechnical Engineer before being brought to the Site. All imported non-expansive fill material should be granular in nature and be a select fill meeting the following requirements: minimum R-value of 35, maximum expansion pressure of 100, and maximum plasticity index of 12. Materials should be compacted as described above for recompacted on-site fill materials. A representative of a Geotechnical Engineer should observe site grading including stripping, scarifying, and placing and compacting fills and backfills.

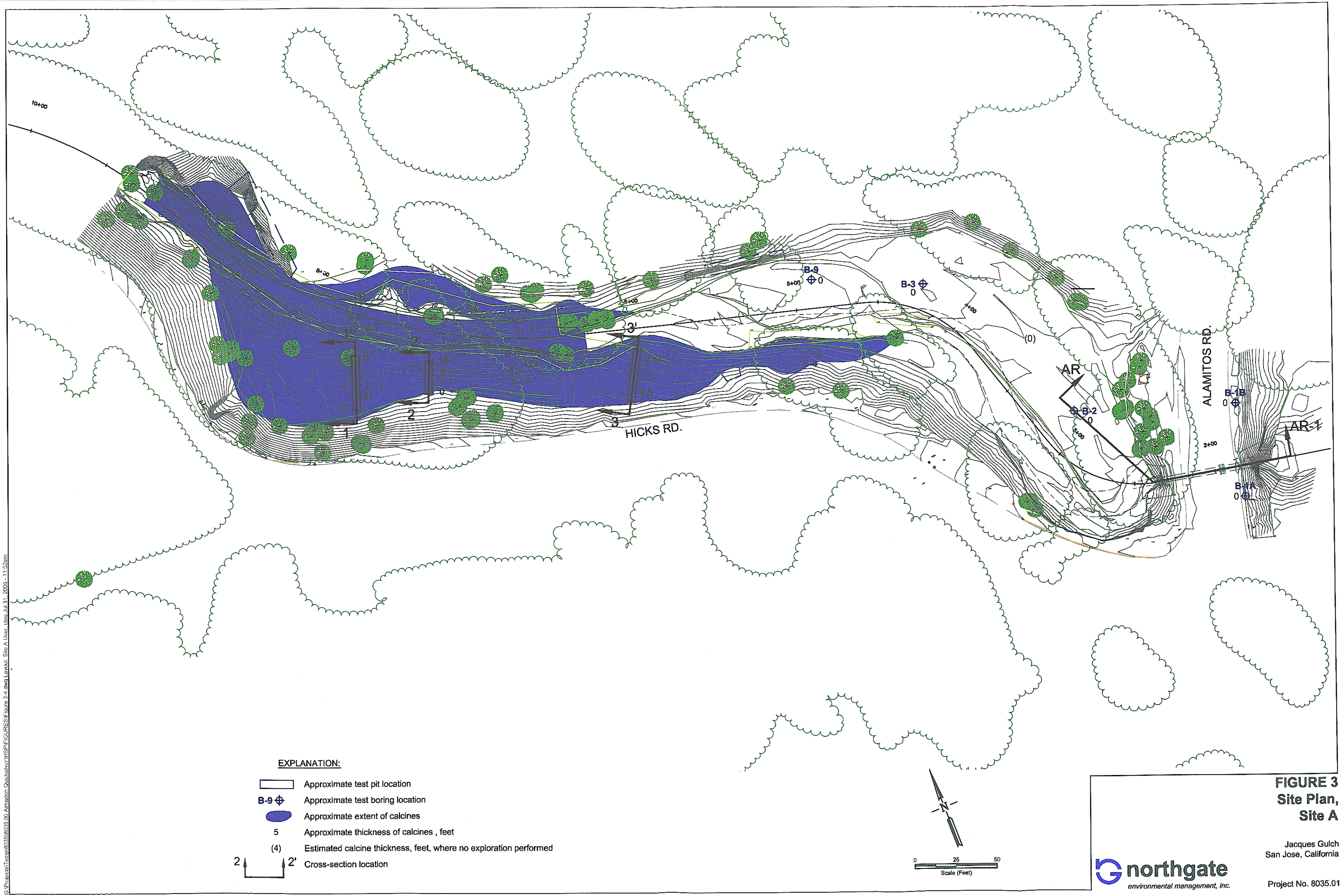
Slopes

Cut Slopes - Temporary cut slopes in native or fill soils should be no steeper than 1 horizontal to 1 vertical. Cut slopes should be observed by the Geotechnical Engineer to verify the stability of the exposed soils.

Fill Slopes - The erosion repair fill should be keyed-into existing competent material or bedrock. Keyways should be at least 4 feet deep and 8 feet wide to provide sufficient connection between the existing soils and fill, and ample width for the construction equipment. The keyway should extend along the full length of the fill slope. Keyways should be back-sloped at an inclination of at least five percent. The fill slope inclination should be no steeper than 2 horizontal to 1 vertical.

Pavement Design

We recommend that the repaired pavement section be constructed to match the existing pavement design materials and thicknesses except the asphalt concrete should be the existing thickness plus 1 inch. When the excavation is made for the culvert, we recommend that the existing pavement section be removed a minimum of 1 foot beyond the limits of the excavation and be repaved in the same manner as the trench area.



EXPLANATION:

▭	Approximate test pit location
B-9 ⊕	Approximate test boring location
●	Approximate extent of calcines
5	Approximate thickness of calcines , feet
(4)	Estimated calcine thickness, feet, where no exploration performed
2 2'	Cross-section location

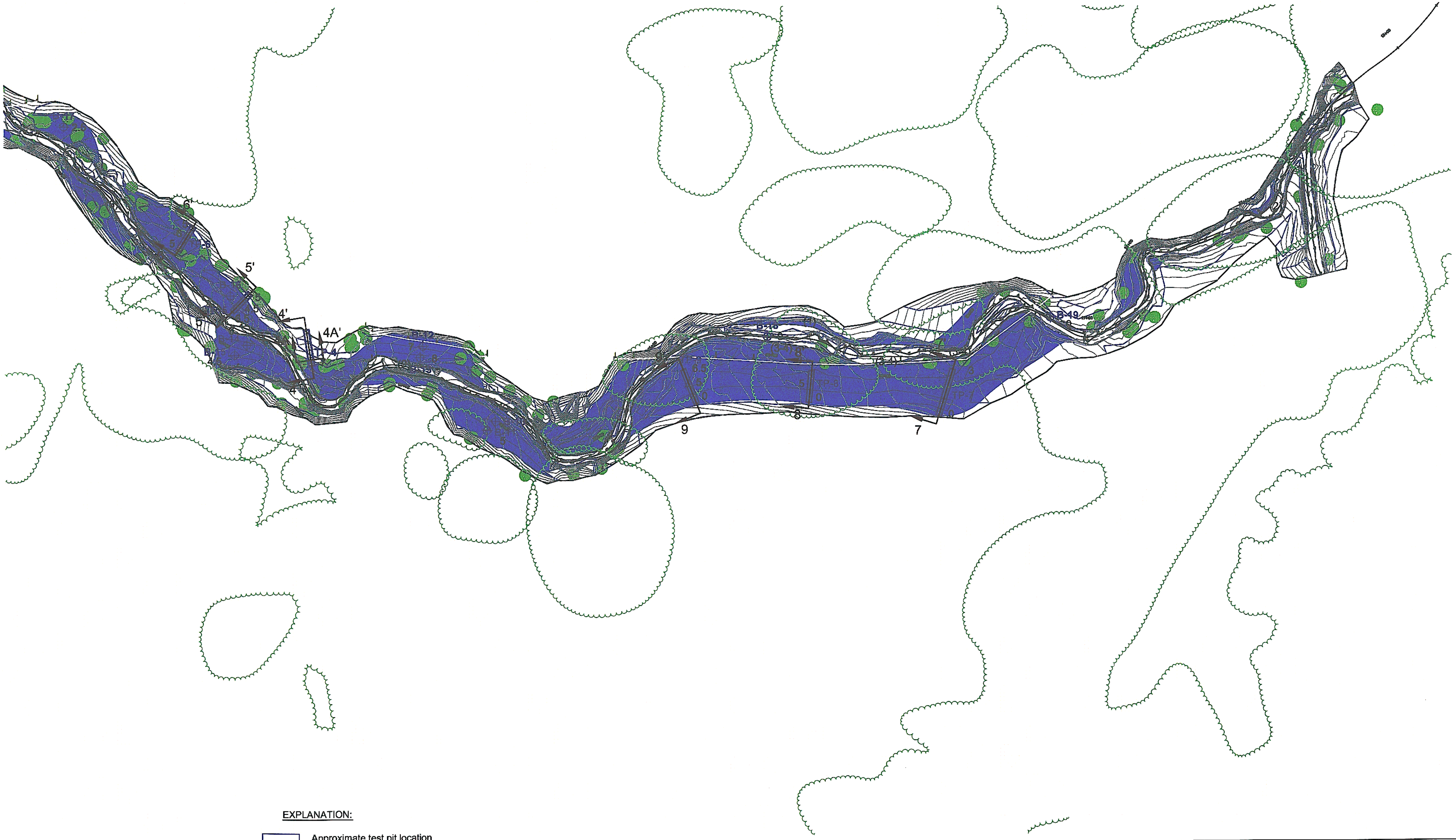
FIGURE 3
Site Plan, Site A

Jacques Gulch
San Jose, California

northgate
environmental management, inc.

Project No. 8035.01

G:\Projects\Temp\8035\8035.00 Almaden Quicksilver\HSP\FIGURES\Figure 3-4.dwg Layout: Site A User: oleg Jul 31, 2006 - 11:52am



EXPLANATION:

▭ Approximate test pit location

B-18 ⊕ Approximate test boring location

● Approximate extent of calcines

5 Approximate thickness of calcines, feet

(4) Estimated calcine thickness, feet, where no exploration performed

9 ⌊⌋ 9' Cross-section location

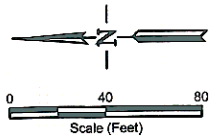


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FIGURE 4
Site Plan, Site B

Jacques Gulch
San Jose, California

Project No. 8035.01

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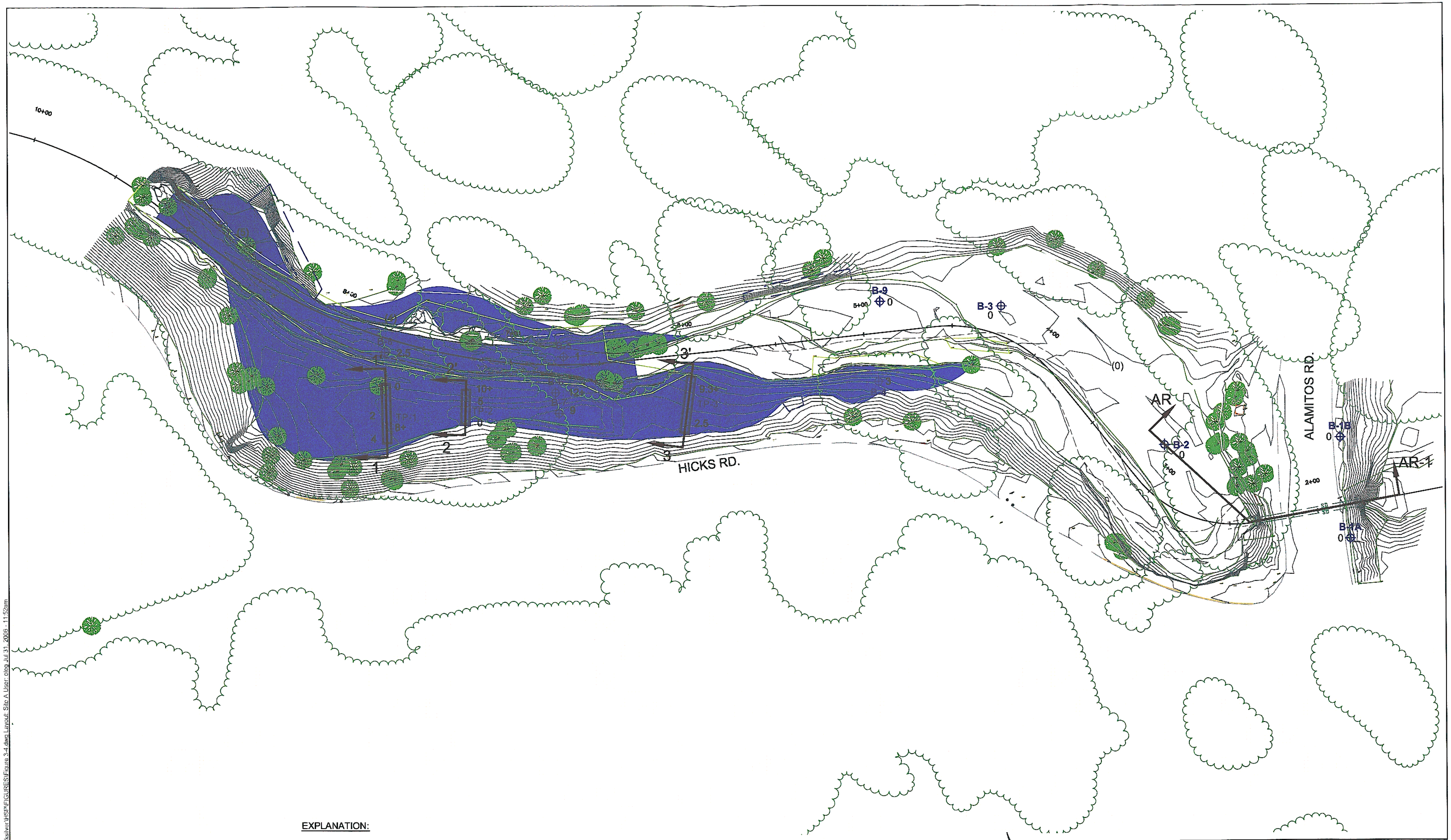

EXPLANATION:

☐	Approximate test pit location
B-9 ⊕	Approximate test boring location
●	Approximate extent of calcines
5	Approximate thickness of calcines , feet
(4)	Estimated calcine thickness, feet, where no exploration performed
2 ⌊⌋ 2'	Cross-section location

FIGURE 3
Site Plan, Site A

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San Jose, California

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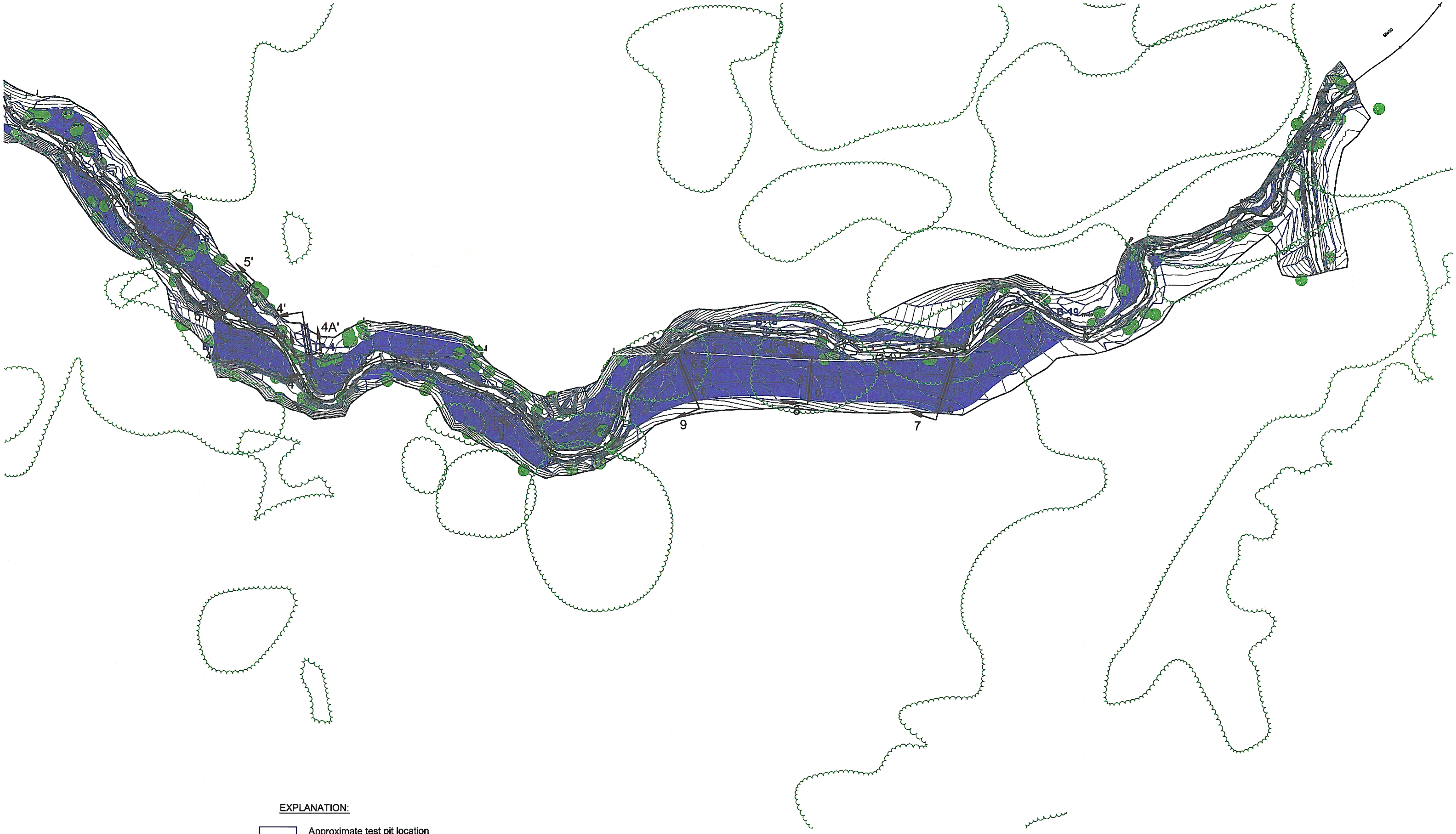
Project No. 8035.01

G:\Projects\Temp\8035\8035.00 Almaden Quicksilver\HSP\FIGURES\Figure 3-4.dwg Layout: Site A User: oleg Jul 31, 2006 - 11:52am



EXPLANATION:

▭	Approximate test pit location
B-18 ⊕	Approximate test boring location
⬬	Approximate extent of calcines
5	Approximate thickness of calcines, feet
(4)	Estimated calcine thickness, feet, where no exploration performed
9 ⌞⌟ 9'	Cross-section location

N

0 40 80
Scale (Feet)

FIGURE 4
Site Plan,
Site B

Jacques Gulch
San Jose, California

northgate
environmental management, inc.

Project No. 8035.01

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BORING NUMBER B-1A

PAGE 1 OF 1

PROJECT NAME Jacques Gulch

PROJECT NUMBER 8035.01 **PROJECT LOCATION** San Jose, California

DATE STARTED 10/12/05 **COMPLETED** 10/12/05 **Ground ELEVATION** **HOLE SIZE** 4"

DRILLING CONTRACTOR Clearheart Drilling **GROUND WATER LEVELS:** **AT TIME OF DRILLING** ---

DRILLING METHOD Solid Stem Auger **AFTER DRILLING** --- **AT END OF DRILLING** ---

LOGGED BY JWO **CHECKED BY** TXS **SURFACE CONDITIONS:**

NOTES: Refusal at 5.0 feet moved hole

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1		SILTY SAND (SM)(FILL); loose, dry, brown, ~10% gravel - 3/4"-, subangular						
2		Hard drilling						
3		Very hard drilling - solid rock and concrete, very slow						
4								
5		Refusal @5.0 feet Bottom of borehole at 5.0 feet bgs.						

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BORING NUMBER B-1B

PAGE 1 OF 1

PROJECT NAME Jacques Gulch

PROJECT NUMBER 8035.01 **PROJECT LOCATION** San Jose, California

DATE STARTED 10/12/05 **COMPLETED** 10/12/05 **Ground ELEVATION** **HOLE SIZE** 4"

DRILLING CONTRACTOR Clearheart Drilling **GROUND WATER LEVELS:** **AT TIME OF DRILLING** ---

DRILLING METHOD Solid Stem Auger **AFTER DRILLING** --- **AT END OF DRILLING** ---

LOGGED BY JWO **CHECKED BY** TXS **SURFACE CONDITIONS:** Roadside dirt

NOTES:

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1		SILTY SAND (SM); Fill, loose, dry, brown, ~10% gravel - 3/4"-, subangular						
2								
3		SANDY CLAY (CL); Fill, medium stiff, moist, brown, trace gravel, 3/8"-, subangular						
4								
5		Contains fragments of brick and asphalt, brown mottled with gray and yellowish brown	1	22				
6			2	20				
7								
8								
9		SANDY CLAY (CL); stiff, moist, dark brown, trace of gravel, 2"-, subangular, gravel is gray/blue	3	19		110	14	Unconfined Compression 3060
10								
11		SANDY SILTY CLAY (CL); stiff, moist, dark brown, rootlets, trace gravel, subrounded	4	10				
12		SANDY CLAY (CL); moist, stiff, dark brown and yellowish brown, trace gravel (angular rock fragments 1.5"-).						
13			5	21				
14			6	13				
15								
16		Becomes very moist to wet	7	13				
17		SILTY SAND (SM); *dense, wet, brown 10-20% gravel, including serpentinite*						
18								
19			8	32				
20		SANDY CLAY (CL); very stiff, very moist, brown/orangish brown, with some gravel	9	50		116	17	Unconfined Compression 6730
21		Bedrock-sandsotne	10	50/6"				
22		Bedrock-greenstone						

Bottom of borehole at 22.0 feet bgs.

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BORING NUMBER B-2

PAGE 1 OF 1

PROJECT NAME Jacques Gulch

PROJECT NUMBER 8035.01 **PROJECT LOCATION** San Jose, California

DATE STARTED 10/10/05 **COMPLETED** 10/10/05 **Ground ELEVATION** ____ **HOLE SIZE** 2"

DRILLING CONTRACTOR Clearheart Drilling **GROUND WATER LEVELS:** **AT TIME OF DRILLING** ---

DRILLING METHOD ____ **AFTER DRILLING** --- **AT END OF DRILLING** ---

LOGGED BY TXS **CHECKED BY** ____ **SURFACE CONDITIONS:** ____

NOTES: ____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
0		SANDY SILT (ML); loose, dry, brown.						
1 2 3 4	●	SANDY GRAVEL (GW-GM); medium dense, dry, brown	☒ 1	34				
5	░	SILTY Coarse SAND (SM); dense, damp, with gravel						
6 7 8	░	SILTY SAND (SM); loose, damp, reddish brown, trace to some gravel to 2" max.	☒ 2	9				
9	░		☒ 3	7				
10		Fine SANDY SILTY CLAY (CL); medium stiff, dark brown						
11 12 13	▨	SANDY CLAY (CL); medium stiff to stiff,dark gray, trace of rounded gravel to 3/4"						
14 15	▨	Becomes Silty	☒ 4	17		104	23	Unconfined Compression 1560
		Bottom of borehole at 15.0 feet bgs.						

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BORING NUMBER B-3

PAGE 1 OF 1

PROJECT NAME Jacques Gulch
PROJECT NUMBER 8035.01 **PROJECT LOCATION** San Jose, California
DATE STARTED 10/11/05 **COMPLETED** 10/11/05 **Ground ELEVATION** ______ **HOLE SIZE** 4"
DRILLING CONTRACTOR Clearheart Drilling **GROUND WATER LEVELS:** ∇ **AT TIME OF DRILLING** 7.4 ft
DRILLING METHOD Solid Stem Auger/Split Spoon **AFTER DRILLING** --- **AT END OF DRILLING** ---
LOGGED BY JWO **CHECKED BY** TXS **SURFACE CONDITIONS:** Stream terrace
NOTES:

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
		SILTY SAND (SM); loose, dry, brown						
1		SANDY GRAVEL (GW); dense, dry, brown, 2",-subrounded						
2								
3		SILTY SAND (SM); medium dense, moist, brown, 10-20% gravel	☒ 1	38				
4		GRAVELLY SAND (SP); loose, very moist to wet, brown-reddish brown, gravel is 3"-, subangular to subrounded, serpentinite/red claystone rock fragments (occasional lenses of sandy silt)						
5								
6								
7	∇		☒ 2	10				
8								
9		SILTY SAND (SM); loose, saturated, 5-15% gravel	☒ 3	7				
10								
11								
12								
13		SILTY GRAVEL (GW); loose, saturated, brown, trace sand						
14			☒ 4	11				
15								
		Bottom of borehole at 15.0 feet bgs.						

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BORING NUMBER B-4

PAGE 1 OF 1

PROJECT NAME Jacques Gulch

PROJECT NUMBER 8035.01 **PROJECT LOCATION** San Jose, California

DATE STARTED 10/11/05 **COMPLETED** 10/11/05 **Ground ELEVATION** ____ **HOLE SIZE** 4"

DRILLING CONTRACTOR Clearheart Drilling **GROUND WATER LEVELS:** **AT TIME OF DRILLING** ---

DRILLING METHOD Solid Stem Auger **AFTER DRILLING** --- **AT END OF DRILLING** ---

LOGGED BY JWO **CHECKED BY** TXS **SURFACE CONDITIONS:** Grassy/gravel, stream bank

NOTES:

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1 2 3		SAND (SW-SM), loose, dry, reddish-brown (pinkish/gray color when dry), with silt and gravel to 3"-, subrounded calcines						
4 5		*SILTY GRAVEL* (GM); medium dense, dry, brown, with some sand, serpentinite gravel	☒ 1	34				
6		SILTY SAND (SM); medium dense, moist, brown mottled with tan, trace gravel	☒ 2	22				
		Bottom of borehole at 6.5 feet bgs.						

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BORING NUMBER B-5

PAGE 1 OF 1

PROJECT NAME Jacques Gulch
PROJECT NUMBER 8035.01 **PROJECT LOCATION** San Jose, California
DATE STARTED 10/11/05 **COMPLETED** 10/11/05 **Ground ELEVATION** **HOLE SIZE** 4"
DRILLING CONTRACTOR Clearheart Drilling **GROUND WATER LEVELS:** ∇ **AT TIME OF DRILLING** 5.5 ft
DRILLING METHOD Solid Stem Auger **AFTER DRILLING** — ▼ **AT END OF DRILLING** 5.3 ft
LOGGED BY JWO **CHECKED BY** TXS **SURFACE CONDITIONS:**
NOTES:

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1		SILTY SANDY GRAVEL (GW); very dense, moist, brownish gray, very hard drilling, calcine/cemented material	☒ 1	18		104	6	
2		SITLY GRAVEL (GM); medium dense, very moist to wet, brown, with sand, gravel is 1"-, subangular to subrounded						
3								
4								
5	▼	SILTY SAND (SM); medium dense, brown, trace gravel						
6		SAND (SP-SM); dense, dark brown, with silt and gravel, dark red gravels in sample	2	26				
7								
8								
9		SANDY CLAY (CL); dark brown/dark gray Hole collapsed to 7 1/2 feet Bottom of borehole at 9.5 feet bgs.	☒ 3	10		122	14	

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BORING NUMBER B-6

PAGE 1 OF 1

PROJECT NAME Jacques Gulch

PROJECT NUMBER 8035.01

PROJECT LOCATION San Jose, California

DATE STARTED 10/11/05

COMPLETED 10/11/05

Ground ELEVATION

HOLE SIZE 4"

DRILLING CONTRACTOR Clearheart Drilling

GROUND WATER LEVELS:

AT TIME OF DRILLING ---

DRILLING METHOD Solid Stem Auger/Split Spoon

AFTER DRILLING ---

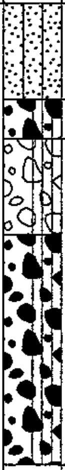
AT END OF DRILLING ---

LOGGED BY JWO

CHECKED BY TXS

SURFACE CONDITIONS: Top of gravelly berm

NOTES:



DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1	SILTY SAND (SM); medium dense, dry-slightly moist, reddish brown, 10-20% gravel, 6"- (1.5" observed in nearby cut), subrounded calcines						
2		1	31				
3	GRAVEL (GW-GM); medium dense, moist, with silt, trace sand, gravel is predominantly serpentinite calcines						
4	GRAVEL (GP-GM); dense, moist, reddish brown, with silt and sand calcines	2	90				
5							
6	GRAVEL (GW-GM); well graded						
7		3	40				
8	Becomes loose						
9		4	8				
10							
11	Gravelly up to 3" in cuttings						
12							
	Hole caved to 7', unable to sample at 12 feet Bottom of borehole at 12.0 feet bgs.						

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BORING NUMBER B-7

PAGE 1 OF 1

PROJECT NAME Jacques Gulch

PROJECT NUMBER 8035.01

PROJECT LOCATION San Jose, California

DATE STARTED 10/11/05

COMPLETED 10/11/05

Ground ELEVATION

HOLE SIZE 4"

DRILLING CONTRACTOR Clearheart Drilling

GROUND WATER LEVELS:

AT TIME OF DRILLING ---

DRILLING METHOD Solid Stem Auger

AFTER DRILLING ---

▼ **AT END OF DRILLING** 7.0 ft

LOGGED BY JWO

CHECKED BY TXS

SURFACE CONDITIONS:

NOTES:

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1		GRAVEL (GW); dense, dry, reddish brown Very hard drilling (calcines)						
2		SILTY SAND (SM); medium dense, moist, dark reddish brown, 10% gravel calcines						
3								
4		GRAVELLY SAND (SP-SM); dense, moist, dark reddish brown, gravel is 2"-, round to subangular, includes serpentinite, basaltic volcanic, reddish gravels, calcines	☒ 1	31				
5								
6								
7		▼ SILTY coarse SAND (SW-SM); loose to medium dense, similar to above, moist to wet calcines	☒ 2	11				
8								
9								LL=33% PL=20% PI=13%
10		CLAYEY SAND (SC); medium dense, dark gray with rust mottling, with gravel						
11			3	9				

Bottom of borehole at 11.5 feet bgs.

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BORING NUMBER B-8

PAGE 1 OF 1

PROJECT NAME Jacques Gulch

PROJECT NUMBER 8035.01

PROJECT LOCATION San Jose, California

DATE STARTED 10/11/05

COMPLETED 10/11/05

Ground ELEVATION

HOLE SIZE 4"

DRILLING CONTRACTOR Clearheart Drilling

GROUND WATER LEVELS:

AT TIME OF DRILLING ---

DRILLING METHOD Solid Stem Auger

AFTER DRILLING ---

AT END OF DRILLING ---

LOGGED BY JWO

CHECKED BY TXS

SURFACE CONDITIONS:

NOTES:

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1		GRAVEL (GW); dense, moist, redish brown, very hard drilling (calcine/cemented layer)						
2 3		SILTY SAND (SM); loose to medium dense, very moist, reddish brown, some gravel calcines	☒ 1	14				
4		SILTY SAND (SM); loose, moist, dark brown, fine grained, <10% gravel	2	12				
		Bottom of borehole at 4.5 feet bgs.						

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BORING NUMBER B-9

PAGE 1 OF 1

PROJECT NAME Jacques Gulch

PROJECT NUMBER 8035.01 **PROJECT LOCATION** San Jose, California

DATE STARTED 10/11/05 **COMPLETED** 10/11/05 **Ground ELEVATION** ______ **HOLE SIZE** 4"

DRILLING CONTRACTOR Clearheart Drilling **GROUND WATER LEVELS:** **AT TIME OF DRILLING** ---

DRILLING METHOD Solid Stem Auger **AFTER DRILLING** --- **AT END OF DRILLING** ---

LOGGED BY JWO **CHECKED BY** TXS **SURFACE CONDITIONS:** Gravelly stream deposit

NOTES: ______

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1		SILTY SAND (SP-SM); loose, dry to slightly moist, brown, with gravel, 4"-, rounded to subrounded						
2		Becomes dense Trace gravel, 1"-, subangular to subrounded	☒ 1	20				
3								
4								
5								
6		SILTY SAND to CLAYEY SAND (SM-SC); loose to medium dense, moist to wet, brown	☒ 2	9				
		Bottom of borehole at 6.5 feet bgs.						

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BORING NUMBER B-10

PAGE 1 OF 1

PROJECT NAME Jacques Gulch

PROJECT NUMBER 8035.01 **PROJECT LOCATION** San Jose, California

DATE STARTED 10/18/05 **COMPLETED** 10/18/05 **Ground ELEVATION** **HOLE SIZE**

DRILLING CONTRACTOR Access Soil Drilling **GROUND WATER LEVELS:** **AT TIME OF DRILLING** ---

DRILLING METHOD Split spoon **AFTER DRILLING** --- **AT END OF DRILLING** ---

LOGGED BY JWO **CHECKED BY** TXS **SURFACE CONDITIONS:**

NOTES:

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1		GRAVELLY SAND (SW); dense, dry to slightly moist, reddish brown, trace silt, calcines	1	36				
2			2	76				
3			3	50/6"				
4			4	73				
5		With more silt						
6			5	71				
7		SILTY GRAVEL (GP-GM); very dense, dry, gray/white						
8			6	67				
		Bottom of borehole at 8.5 feet bgs						

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BORING NUMBER B-11

PAGE 1 OF 1

PROJECT NAME Jacques Gulch
PROJECT NUMBER 8035.01
PROJECT LOCATION San Jose, California
DATE STARTED 10/14/05
COMPLETED 10/14/05
Ground ELEVATION
HOLE SIZE
DRILLING CONTRACTOR Clearheart Drilling
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
DRILLING METHOD
AFTER DRILLING ---
AT END OF DRILLING ---
LOGGED BY TXS
CHECKED BY
SURFACE CONDITIONS:
NOTES:

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1		SILTY GRAVEL (GM); dense, dry, dark reddish brown calcines						
2		GRAVELLY SAND (SW); dense, dry, dark reddish brown calcines	☒ 1	50		93	8	
3			2	68				
4		With SILT (SW-SM)						
5			3	50/3"				
		BOULDER (GP); very dense, gray, refusal	☒ 4	50/2 1/2"				
		Bottom of borehole at 5.5 feet bgs.						

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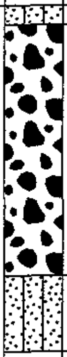
BORING NUMBER B-12

PAGE 1 OF 1

PROJECT NAME Jacques Gulch
PROJECT NUMBER 8035.01
PROJECT LOCATION San Jose, California
DATE STARTED 10/18/05
COMPLETED 10/18/05
Ground ELEVATION
HOLE SIZE
DRILLING CONTRACTOR Access Soil Drilling
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
DRILLING METHOD Minuteman
AFTER DRILLING ---
AT END OF DRILLING ---
LOGGED BY JWO
CHECKED BY TXS
SURFACE CONDITIONS:
NOTES:



DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1		SILTY SAND (SM); loose, dry, brown, some gravel (washed down from hillside)	1	16				
2		SANDY GRAVEL (GW); dense, dry, reddish brown, calcines	2	33				
3		Becomes slightly moist, dark reddish brown	3	36				
4								
5			4	23				
6			5	26				
7		SILTY SAND (SM); medium dense, dry, brown, trace gravel						
8			6	29				
9		With more GRAVEL (GM)						
		Bottom of borehole at 9.0 feet bgs.						

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BORING NUMBER B-13

PAGE 1 OF 1

PROJECT NAME Jacques Gulch

PROJECT NUMBER 8035.01

PROJECT LOCATION San Jose, California

DATE STARTED 10/18/05

COMPLETED 10/18/05

Ground ELEVATION

HOLE SIZE

DRILLING CONTRACTOR Access Soil Drilling

GROUND WATER LEVELS:

AT TIME OF DRILLING ---

DRILLING METHOD Minuteman/Split Spoon

AFTER DRILLING ---

AT END OF DRILLING ---

LOGGED BY JWO

CHECKED BY TXS

SURFACE CONDITIONS: Grassy stream bank terrace

NOTES:

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1		GRAVELLY SAND (SW); dense, dry, reddish brown, calcines	1	28				
2			2	47				
3		Becomes slightly moist, darker, with trace of SILT (SP-SM)						
4			3	44				
5			4	75				
6								
7			5	44				
8		SANDY GRAVEL (GP-GM); very dense, moist, reddish brown calcines	6	65				
9		Rock in shoe Boulders/Bedrock very dense, moist, gray *Refusal*						

Bottom of borehole at 9.0 feet bgs.

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BORING NUMBER B-14A&B

PAGE 1 OF 1

PROJECT NAME Jacques Gulch
PROJECT NUMBER 8035.01
PROJECT LOCATION San Jose, California
DATE STARTED 10/17/05
COMPLETED 10/17/05
Ground ELEVATION
HOLE SIZE 4"
DRILLING CONTRACTOR Access Soil Drilling
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
DRILLING METHOD Minuteman/Solid Auger
AFTER DRILLING ---
AT END OF DRILLING ---
LOGGED BY JWO
CHECKED BY TXS
SURFACE CONDITIONS:
NOTES: B-14A from 0 to 4.5 feet, B-14B from 4.5 feet to 9 feet

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1		GRAVELLY SAND (SW-SM); medium dense to dense, dry, reddish brown, calcine gravels, trace silt	☒ 1	32				
2			☒ 2	81				
3								
4		becomes slightly moist, hole collapsed at 4 1/2 feet, moved 1 foot away and drilled 14B	‖ 3	102				
5								
6								
7		SILTY SAND (SM); dense, slightly moist, dark brown, some gravel	☒ 4	47				
8								
9		GRAVEL (GP); very dense, brown	‖ 5	73				
		Bottom of borehole at 9 0 feet bgs.						

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BORING NUMBER B-15

PAGE 1 OF 1

PROJECT NAME Jacques Gulch

PROJECT NUMBER 8035.01 **PROJECT LOCATION** San Jose, California

DATE STARTED 10/18/05 **COMPLETED** 10/18/05 **Ground ELEVATION** **HOLE SIZE** 4"

DRILLING CONTRACTOR Access Soil Drilling **GROUND WATER LEVELS:** **AT TIME OF DRILLING** —

DRILLING METHOD Minuteman **AFTER DRILLING** — **AT END OF DRILLING** —

LOGGED BY JWO **CHECKED BY** TXS **SURFACE CONDITIONS:**

NOTES:

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1		GRAVELLY SAND (SW-SM); dense, dry, reddish brown, trace silt, gravel is 3" subangular calcines	1	35				
2			2	34				
3								
4		Becomes slightly moist	3	33				
5		SANDY SILT (ML); dense, slightly moist, brown, trace gravel						
		Rock, boulder or bedrock Drilling refusal at 5'	4	50/4"				
		Bottom of borehole at 5.8 feet bgs.						

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BORING NUMBER B-16

PAGE 1 OF 1

PROJECT NAME Jacques Gulch

PROJECT NUMBER 8035.01 **PROJECT LOCATION** San Jose, California

DATE STARTED 10/17/05 **COMPLETED** 10/17/05 **Ground ELEVATION** **HOLE SIZE**

DRILLING CONTRACTOR Access Soil Drilling **GROUND WATER LEVELS:** **AT TIME OF DRILLING** ---

DRILLING METHOD Minuteman/Split Spoon **AFTER DRILLING** --- **AT END OF DRILLING** ---

LOGGED BY JWO **CHECKED BY** TXS **SURFACE CONDITIONS:**

NOTES:

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1		SANDY GRAVEL (GP-GM); dense, dry, reddish brown, trace silt, contains calcines. Gravel is 1.5"-, rounded to subrounded	1	47				
2 3			2	50				
4			3	87				
5 6		SILTY SAND (SM); dense, dry to slightly moist, brown, trace to some gravel, low plasticity	4	33				
7			5	56				
		Bottom of borehole at 7.5 feet bgs.						

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BORING NUMBER B-17

PAGE 1 OF 1

PROJECT NAME Jacques Gulch

PROJECT NUMBER 8035.01

PROJECT LOCATION San Jose, California

DATE STARTED 10/17/05

COMPLETED 10/17/05

Ground ELEVATION

HOLE SIZE

DRILLING CONTRACTOR Access Soil Drilling

GROUND WATER LEVELS:

AT TIME OF DRILLING ---

DRILLING METHOD Minuteman/Split Spoon

AFTER DRILLING ---

AT END OF DRILLING ---

LOGGED BY JWO

CHECKED BY TXS

SURFACE CONDITIONS:

NOTES:

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1	▨	SILTY SAND (SM); loose to medium dense, dry, reddish brown, trace to some gravel, calcines	☒ 1	19				
2			☒ 2	33				
3	▥	SILTY SAND to SANDY SILT (SM-ML); dense, dry, dark brown, trace gravel, roots.	☒ 3	48				
4								
5			4	33				

Bottom of borehole at 5.5 feet bgs.

northgate
geotechnical group

300 Frank H. Ogawa Plaza, Suite 510
Oakland CA 94612
Telephone: (510) 839 0688
Fax: (510) 839 4350

BORING NUMBER B-18

PAGE 1 OF 1

PROJECT NAME Jacques Gulch
PROJECT NUMBER 8035.01
PROJECT LOCATION San Jose, California
DATE STARTED 10/19/05
COMPLETED 10/19/05
Ground ELEVATION
HOLE SIZE
DRILLING CONTRACTOR Access Soil Drilling
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
DRILLING METHOD
AFTER DRILLING ---
AT END OF DRILLING ---
LOGGED BY
CHECKED BY
SURFACE CONDITIONS:
NOTES:

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1		SANDY GRAVEL (GW); very dense, dry, brown, gravel is 12"-, rounded to subrounded, trace silt	1	100/5"				
			2	100/0				
		Bottom of borehole at 1.5 feet bgs.	3	100/1"				

northgate
geotechnical group

300 Frank H. Ogawa Plaza, Suite 510
Oakland CA 94612
Telephone: (510) 839 0688
Fax: (510) 839 4350

BORING NUMBER B-19

PAGE 1 OF 1

PROJECT NAME Jacques Gulch

PROJECT NUMBER 8035.01 **PROJECT LOCATION** San Jose, California

DATE STARTED 10/19/05 **COMPLETED** 10/19/05 **Ground ELEVATION**____ **HOLE SIZE**____

DRILLING CONTRACTOR____ **GROUND WATER LEVELS:** **AT TIME OF DRILLING** ---

DRILLING METHOD____ **AFTER DRILLING** --- **AT END OF DRILLING** ---

LOGGED BY____ **CHECKED BY**____ **SURFACE CONDITIONS:**____

NOTES:____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER
1	▨	CLAYEY GRAVELLY SAND (GW-SC); dense, dry, light brown to brown, large cobbles at surface, in sample gravel is 1" to 1.5"-subangular to subrounded.	1	99				
2	▨		2	100/5"				
3	▨	More gravel. Refusal	3	95/6"				
		Bottom of borehole at 3.5 feet bgs.						

Appendix B

HEC-RAS MODEL ON COMPACT DISC

A compact disc of the HEC-RAS model has been provided to:

Keiron Nawbatt
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118
Telephone: (408) 265-2607, ext. 2896
Email: knawbatt@valleywater.org

A full listing of the files contained in the model appears on the next page.

HEC-RAS Model Listing – 195 files (13,157 kb)

input.cln	49,238 kb
jgs1.f01	533 kb
jgs1.f02	548 kb
jgs1.f03	546 kb
jgs1.f04	451 kb
jgs1.f05	276 kb
jgs1.f06	1,192 kb
jgs1.f07	1,322 kb
jgs1.f08	1,577 kb
jgs1.f09	1,589 kb
jgs1.f10	1,403 kb
jgs1.g01	32,779 kb
jgs1.g02	97 kb
jgs1.g03	22,397 kb
jgs1.g04	94 kb
jgs1.g05	65,949 kb
jgs1.g06	9,674 kb
jgs1.g07	58,878 kb
jgs1.g08	32,710 kb
jgs1.g09	32,796 kb
jgs1.g10	31,218 kb
jgs1.g11	31,227 kb
jgs1.g12	31,236 kb
jgs1.g13	31,240 kb
jgs1.g14	31,242 kb
jgs1.g15	31,239 kb
jgs1.g16	31,237 kb
jgs1.g17	31,240 kb
jgs1.O01	162,112 kb
jgs1.O02	162,112 kb
jgs1.O03	52,416 kb
jgs1.O04	52,736 kb
jgs1.O05	179,520 kb
jgs1.O06	179,520 kb
jgs1.O07	194,112 kb
jgs1.O08	0 kb
jgs1.O09	44,864 kb
jgs1.O10	194,112 kb
jgs1.O11	197,184 kb
jgs1.O12	197,184 kb
jgs1.O13	162,112 kb
jgs1.O14	197,184 kb
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jgs1.O16	283,520 kb
jgs1.O17	465,280 kb
jgs1.O18	94,656 kb
jgs1.O19	101,760 kb
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jgs1.p02	1,163 kb
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jgs1.p19	1,039 kb
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jgs1.r10	28,808 kb
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jgs1.r13	35,931 kb
jgs1.r14	57,376 kb
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Site1.g11	31,227 kb
Site1.g12	31,236 kb
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Site1.g18	32,618 kb
Site1.g19	32,871 kb
Site1.g20	33,051 kb
Site1.g21	32,984 kb
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Site1.O02	162,112 kb
Site1.O03	52,416 kb
Site1.O04	52,736 kb
Site1.O05	179,520 kb
Site1.O06	179,520 kb
Site1.O07	194,112 kb
Site1.O08	0 kb
Site1.O09	44,864 kb
Site1.O10	194,112 kb
Site1.O11	197,184 kb
Site1.O12	197,184 kb
Site1.O13	162,112 kb
Site1.O14	197,184 kb
Site1.O15	156,288 kb
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Site1.O21	178,496 kb
Site1.O22	712,320 kb
Site1.O23	465,280 kb
Site1.O24	457,280 kb
Site1.O25	410,752 kb
Site1.O26	457,280 kb
Site1.O27	465,280 kb
Site1.O28	430,016 kb
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Site1.p01	1,030 kb
Site1.p02	1,163 kb
Site1.p03	1,158 kb
Site1.p04	1,158 kb
Site1.p05	1,152 kb
Site1.p06	1,156 kb
Site1.p07	1,152 kb
Site1.p08	1,147 kb
Site1.p09	1,152 kb
Site1.p10	1,152 kb
Site1.p11	1,159 kb
Site1.p12	1,152 kb
Site1.p13	1,165 kb
Site1.p14	1,152 kb
Site1.p15	1,039 kb
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Site1.p18	1,039 kb
Site1.p19	1,039 kb
Site1.p20	1,039 kb
Site1.p21	1,039 kb
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Site1.prj	1,429 kb
Site1.r01	33,364 kb
Site1.r22	37,881 kb
Site1.r23	37,022 kb
Site1.r24	37,046 kb
Site1.r25	36,743 kb
Site1.r26	37,046 kb
Site1.r27	37,158 kb
Site1.r28	35,016 kb
Site1.r29	34,837 kb
try.geo	151,996 kb
tt.geo	100,293 kb

Appendix C

COST ESTIMATE

CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST
ALTERNATIVE 1 - RECOMMENDED PROJECT

Project: Jacques Gulch Restoration at Santa Clara County, Ca.
Santa Clara Valley Water District
Santa Clara County, CA

28-Jul-08

No.	Item	Unit	Unit Price	Quantity	Amount ($)	Remark
1	**Mobilization**	LS	$ 150,000	1	$ 150,000	
	Sub-total				$ 150,000	
2	**Site preparation**	LS				
2.1	Access road preparation	LS	$ 50,000	1	$ 50,000	
2.2	Traffic control	LS	$ 14,400	1	$ 14,400	
2.3	Temporary drainage system	LF	$ 25	900	$ 22,500	
2.4	Clear & Grub	AC	$ 3,000	3	$ 9,000	
2.5	Dewatering	LS	$ 100,000	1	$ 100,000	
	Sub-total				$ 195,900	
3	**Calcine removal**					
3.1	Excavation	CY	$ 45	12,500	$ 562,500	In-place volume
3.2	Transportation to consolidation site	CY	$ 10	15,000	$ 150,000	Expansion Factor of 1.2
3.3	Disposal site and Wood Rd grading	LS	$ 304,000	1	$ 304,000	
	Sub-total				$ 1,016,500	
4	**Culvert**					
4.1	84" dia RCP (includingcut-off walls)	LF	$ 320	102	$ 32,640	
4.2	Excavation	CY	$ 10	2,470	$ 24,700	Open cut no trench box
4.4	Demolition & disposal	LS	$ 15,000	1	$ 15,000	
4.5	Bedding gravel	CY	$ 50	65	$ 3,250	
4.6	Soil backfill and compaction	CY	$ 10	2,370	$ 23,700	
4.7	Concrete slurry	CY	$ 175	24	$ 4,148	
	Sub-total				$ 103,438	
5	**Road repair**					
5.1	Alamitos Road					
5.1.1	AC Pavement	SF	$ 15	2,016	$ 30,240	
5.1.2	Class III AB (including compaction)	CY	$ 30	44	$ 1,320	
5.1.3	Shoulder	SF	$ 5	378	$ 1,890	
5.1.4	Curb	LF	$ 10	65	$ 650	
5.1.5	Guard rail	LF	$ 100	170	$ 17,000	
5.2	Hicks road					
5.2.1	AC Pavement	SF	$ 15	400	$ 6,000	
5.2.2	Class III AB (including compaction)	CY	$ 30	13	$ 390	
5.2.3	Shoulder	SF	$ 5	300	$ 1,500	
5.2.4	Guard rail	FT	$ 100	100	$ 10,000	
5.3	Lane striping	SF	$ 10,000	1	$ 10,000	
	Sub-total				$ 78,990	
6	**Restoration Elements**					
6.1	Earthwork					
6.1.1	Excavation	CY	$ 10	2367	$ 23,670	in-place volume, dig and haul
6.1.2	Backfill	CY	$ 10	2266	$ 22,660	in-place volume, place and compact, using on-site native material
6.2	Channel Treatments					
6.2.1	Step pool transition	LF	$ 1,500	125	$ 187,500	
6.2.2	Native material revetment	LF	$ 1,200	455	$ 546,000	
6.2.3	Retention basin stabilization	EA	$ 500	10	$ 5,000	
6.2.4	Vegetated boulder revetment	LF	$ 1,200	210	$ 252,000	
6.2.5	Willow wall revetment	LF	$ 300	235	$ 70,500	
6.2.6	Inlet/Outlet Weir	EA	$ 2,000	2	$ 4,000	
6.2.7	Brush mat	SF	$ 150	440	$ 66,000	Bank stabilization in Site B
6.2.8	Brush mat transition	EA	$ 1,000	8	$ 8,000	Rock slope protection at each end of brush mat.
6.2.9	Graded Bank Stabilization	SF	$ 10	2640	$ 26,400	Biodegradable fabric & seeding on graded banks above brush mat
6.2 10	Rock toe protection	LF	$ 200	440	$ 88,000	Cost varies depending on rock sizing and dimensions (to be determined).
6.2.11	Vegetated rock toe protection	LF	$ 250	560	$ 140,000	Cost varies depending on rock sizing and dimensions (to be determined).
6.2.12	Rootwad	EA	$ 2,000	13	$ 26,000	Single embedded root wad.
6.2.13	Log Weir	EA	$ 5,000	4	$ 20,000	Channel-spanning weir (assumes 3 logs per structure)
6.2.14	Formalize Existing Step Pools	EA	$ 5,000	8	$ 40,000	Reform existing step pools in upper reach following construction disturbance.
6.2.15	New Step Pools	EA	$ 10,000	6	$ 60,000	Cost varies depending on rock sizing and length (to be determined).
	Sub-total				$ 1,585,730	

CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST
ALTERNATIVE 1 - RECOMMENDED PROJECT

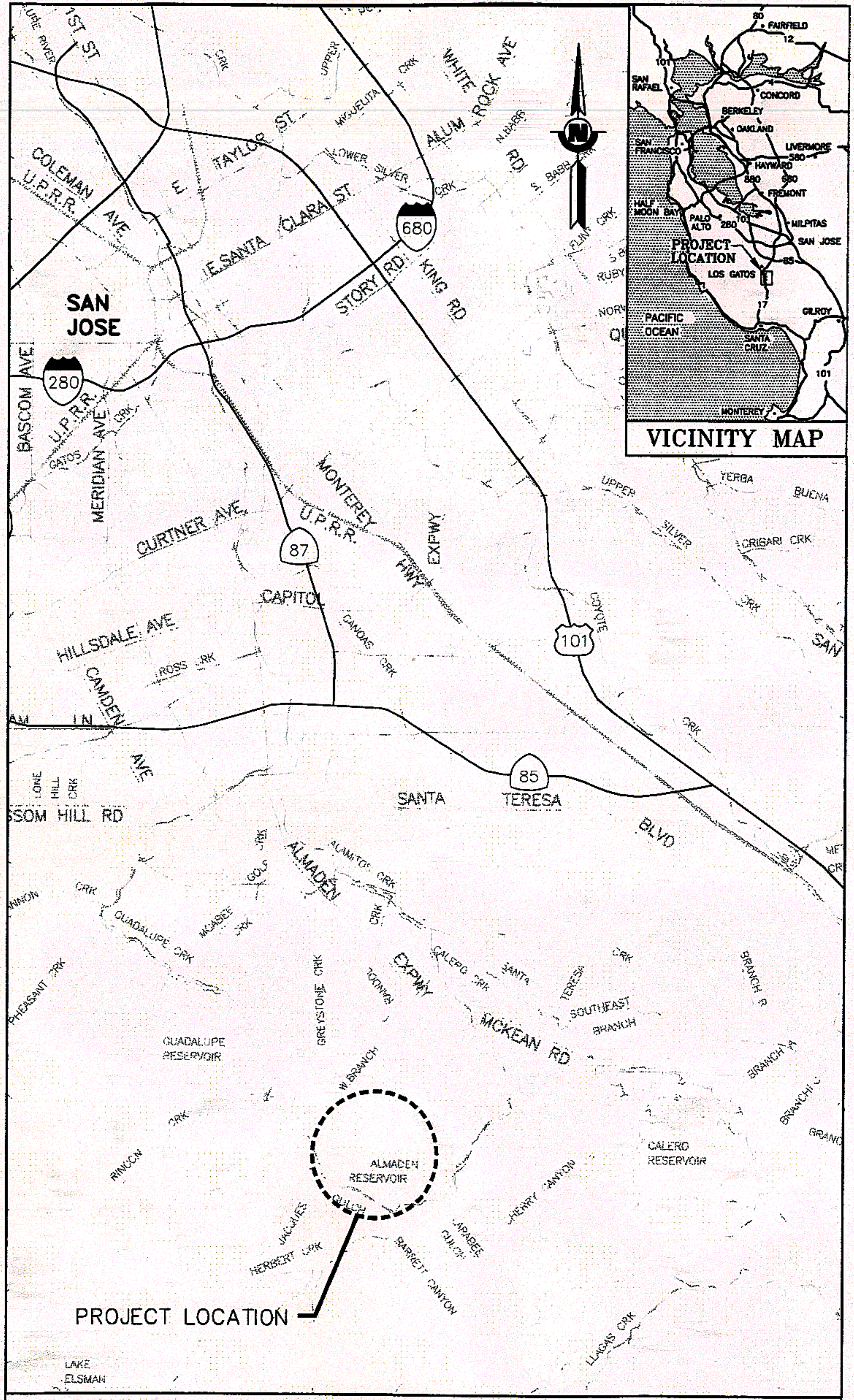
Project: Jacques Gulch Restoration at Santa Clara County, Ca.
Santa Clara Valley Water District
Santa Clara County, CA

28-Jul-08

7	**Vegetation**					
7.1	Plant Collection			-		
7.1a	*Collect, prepare and store acorns*	EA	$ 9	554	$ 4,986	
7.2	Plant Installation					
7.2a	*Acorns*	EA	$ 10	554	$ 5,540	Assume: Site B: 20% tree poles, 25% coyote shrub, 55% Oaks (acorns). Site A: 65% tree poles, 15% coyote shrub, 25% Oaks (acorns). 50% Mortality with replanting in Year 2 of 25% and replanting in Year 3 of 25%. Replanting costs are included in post contruction monitoring.
7.2b	*Tree Poles*	EA	$ 20	982	$ 19,640	
7.2c	*Willow Poles*	EA	$ 15	1,167	$ 17,505	
7.2d	*Containerized Shrubs*	EA	$ 20	209	$ 4,180	
7.2e	*Hydroseed Native Grass*	AC	$ 5,000	2.00	$ 10,000	
7.2f	*Weed mats*	EA	$ 4	1,213	$ 4,852	
7.2g	*Mulch*	AC	$ *7,500*	*0.69*	$ *5,175*	
7.2h	*Tree Protection*	EA	$ 38	837	$ 31,806	
	Sub-total				$ 103,684	
8	**Total Construction Cost**				$ 3,234,242	
9	**Post Construction Monitoring**					
9.1	Plant Inspection/Replacement	LS	$ 84,000	1	$ 84,000	
9.2	Stream Restoration Inspection	LS	$ 60,000	1	$ 60,000	
	Sub-total				$ 144,000	
10	**Additional Items**					
10.1	Special Provisions Requirements		10%		$ 323,000	
10.2	Planning, Survey, Engineering Design & Construction Management		22%		$ 707,000	
10.3	Engineering During Construction		5%		$ 162,000	
10.4	Supervision and Administration		10%		$ 323,000	
	Sub-total				$ 1,515,000	
11	**Grand Total**				$ 4,893,242	

Appendix D

CONCEPTUAL DRAWINGS FOR RECOMMENDED PROJECT



LOCATION MAP
SCALE: 1"=5000'

MAP AND GENERAL PLAN

FOR

JACQUES GULCH RESTORATION PROJECT

Santa Clara Valley Water District℠

PROJECT PREPARED BY:

Aspen Environmental Group

Michael Thomas, P.E. 07/10/08
NAME DATE
PRINCIPAL ENGINEER

MICHAEL STUART THOMAS
No. C46957
Exp. 09/30/09

PROJECT APPROVAL:

07/10/08
DEVIN MODY DATE
SENIOR ENGINEER
LP/WV/GUAD WATERSHED DIVISION

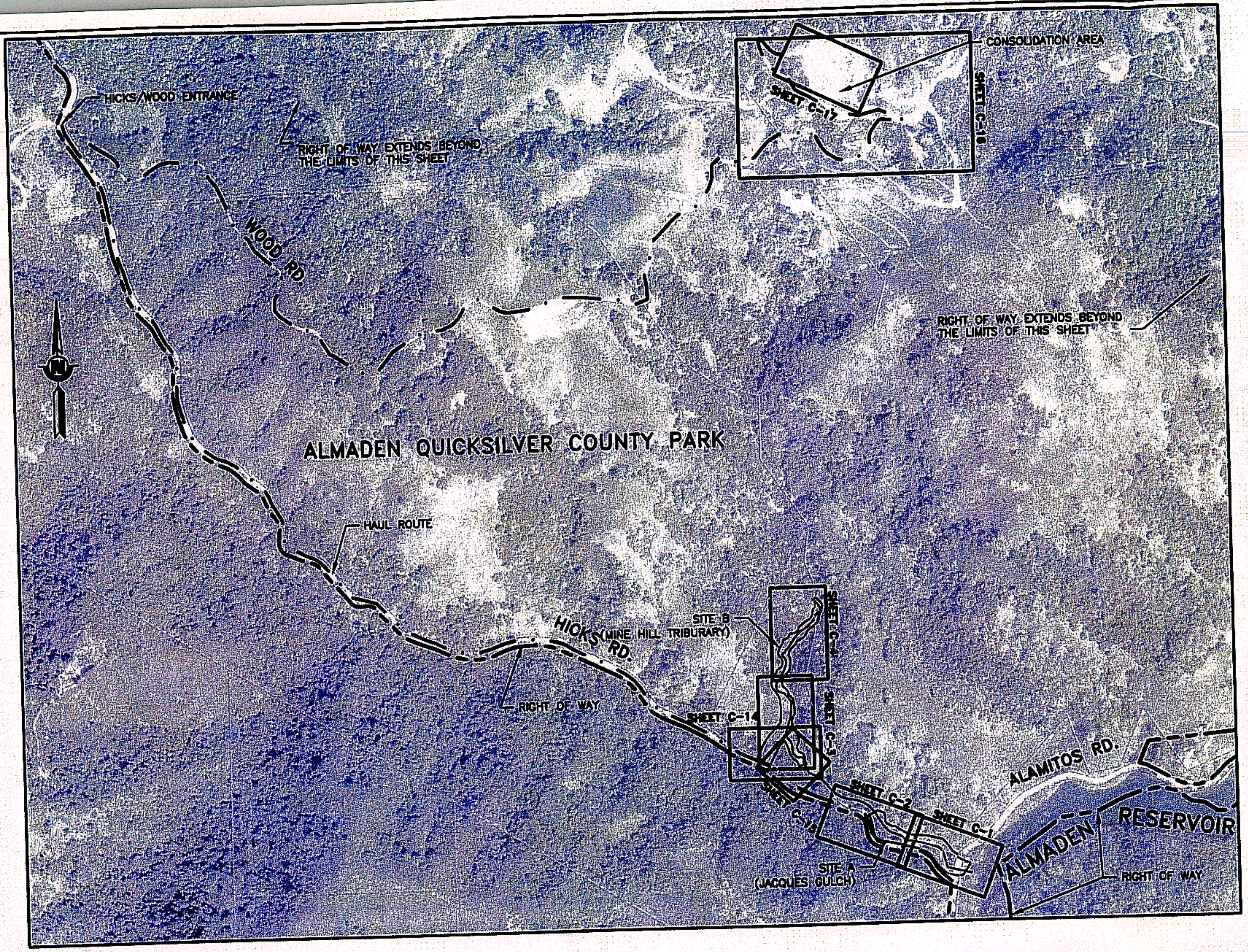
07/10/08
AL GUREVICH DATE
ENGINEERING UNIT MANAGER
LP/WV/GUAD WATERSHED DIVISION

ACCEPTED BY DISTRICT:

7-17-08
BEAU GOLDIE DATE
DEPUTY OPERATING OFFICER
LP/WV/GUAD WATERSHED DIVISION

PRELIMINARY
NOT FOR CONSTRUCTION
07/10/08

JACQUES GULCH CONCEPTUAL RESTORATION PLAN MAP AND TITLE PAGE	SCALE NOT TO SCALE	PROJECT NUMBER 91854002
	VERIFY SCALES 0 1" BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	SHEET CODE: G-1 1 OF 38



SITE PLAN (INCL. INDEX MAP)

SCALE: 1"=500'

GENERAL NOTES

1. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SPECIFIED.
2. THE CONSTRUCTION CENTERLINE IS ALONG THE PROPOSED CHANNEL ALIGNMENT.
3. THE SURVEY BASELINE, ALONG THE EXISTING CHANNEL ALIGNMENT, IS SHOWN FOR REFERENCE ONLY.
4. CALCINE SOILS WILL BE REMOVED WITHIN PROJECT LIMITS.
5. ALL CHANNEL AND BANK STABILIZATION MEASURES TO BE CONFIRMED SUBSEQUENT TO CALCINE SOILS REMOVAL AND RESTORATION GRADING.
6. IN STREAM AND BANK STABILIZATION MEASURES SHALL BE ADJUSTED/CONFIRMED BASED ON FINISHED GRADE/ORIGINAL CHANNEL DIMENSIONS AND GEOMORPHIC FEATURES. VERIFY IN FIELD.
7. BRUSH MAT OR EQUIVALENT BIOTECHNICAL STABILIZATION SHALL BE INSTALLED ON ALL CUT BANKS AT OUTSIDE BENDS. 3:1 SLOPE MAXIMUM.
8. EROSION CONTROL AND REVEGETATION PLANS WILL BE DEVELOPED FOR ALL DISTURBED, GRADED AND EXPOSED SOIL AREAS.
9. EXTENTS OF GRADING ARE APPROXIMATE BASED ON PWA SITE RECONNAISSANCE (3/24/06).
10. STATIONING FOR THE LONGITUDINAL PROFILE IS BASED ON THE CONSTRUCTION CENTERLINE.
11. SLOPES SHOWN ARE APPROXIMATE.
12. THE BASIS OF ELEVATION IS BM 416 (BRASS DISK MONUMENT BOX LOCATED AT THE INTERSECTION OF EAST BOUND HICKS ROAD AND ALAMITOS ROAD. APPROXIMATELY 55 FEET SOUTHEAST OF THE INTERSECTION, SANTA CLARA COUNTY). EL = 619.96 FEET. ELEVATIONS SHOWN ARE BASED ON NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88)
13. THE COORDINATES AND BEARINGS ARE BASED ON THE CALIFORNIA COORDINATE SYSTEM, ZONE 3 NORTH AMERICAN DATUM 1983. DISTANCES SHOWN ARE GROUND DISTANCES. MULTIPLY GROUND DISTANCES BY THE GRID FACTOR 0.9999446 TO OBTAIN GRID DISTANCES.

DRAWING INDEX

SHEET NO.	DESCRIPTION	PAGE NO.
	GENERAL DETAILS	
G-1	MAP AND TITLE PAGE	1 OF 38
G-2	DRAWING INDEX, INDEX MAP AND GENERAL NOTES	2 OF 38
G-3	ABBREVIATIONS, LEGEND & SYMBOLS	3 OF 38
G-4	SURVEY LAYOUT TABLE	4 OF 38
G-5	SURVEY LAYOUT	5 OF 38
G-6	SURVEY LAYOUT	6 OF 38
G-7	SURVEY LAYOUT	7 OF 38
	DEMOLITION DETAILS	
D-1	TREE TABLE	8 OF 38
D-2	SITE A TREE REMOVAL PLAN	9 OF 38
D-3	SITE B TREE REMOVAL PLAN	10 OF 38
D-4	SITE B TREE REMOVAL PLAN	11 OF 38
	CIVIL DETAILS	
C-1	SITE A RESTORATION PLAN	12 OF 38
C-2	SITE A RESTORATION PLAN	13 OF 38
C-3	SITE B RESTORATION PLAN	14 OF 38
C-4	SITE B RESTORATION PLAN	15 OF 38
C-5	SITE A LONGITUDINAL PROFILE	16 OF 38
C-6	SITE B LONGITUDINAL PROFILE	17 OF 38
C-7	SITE A CHANNEL CROSS-SECTIONS	18 OF 38
C-8	SITE A CONSTRUCTION DETAILS	19 OF 38
C-9	SITE A CONSTRUCTION DETAILS	20 OF 38
C-10	SITE A CULVERT PLAN AND PROFILE	21 OF 38
C-11	SITE A CULVERT SECTIONS	22 OF 38
C-12	SITE B CHANNEL CROSS-SECTIONS	23 OF 38
C-13	SITE B RESTORATION DETAILS	24 OF 38
C-14	SITE B TEMPORARY CONSTRUCTION ACCESS PLAN OPTION 1	25 OF 38
C-15	SITE B TEMPORARY CONSTRUCTION ACCESS PLAN OPTION 2	26 OF 38
C-16	CONSOLIDATION SITE PLAN – EXISTING CONDITIONS	27 OF 38
C-17	CONSOLIDATION SITE – PHASE 1 GRADING PLAN	28 OF 38
C-18	CONSOLIDATION SITE – SECTIONS AND DETAILS	29 OF 38
C-19	HAUL ROUTE	30 OF 38
	LANDSCAPE DETAILS	
L-1	SITE A PLANTING PLAN	31 OF 38
L-2	SITE A PLANTING PLAN	32 OF 38
L-3	SITE B PLANTING PLAN	33 OF 38
L-4	SITE B PLANTING PLAN	34 OF 38
L-5	SITE A LANDSCAPE CROSS-SECTIONS	35 OF 38
L-6	SITE A LANDSCAPE CROSS-SECTIONS	36 OF 38
L-7	SITE B LANDSCAPE CROSS-SECTIONS	37 OF 38
L-8	SITE B LANDSCAPE CROSS-SECTIONS	38 OF 38

REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

DATE
07-10-08
DESIGN
K.N.
DRAWN
J. FORD
CHECKED
D.M.

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 06/30/09
CIVIL
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
MM/DD/YY
PROJECT ENGINEER

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN

DRAWING INDEX, INDEX MAP
AND GENERAL NOTES

SCALE
1"=500'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002

SHEET CODE:
G-2

PAGE NUMBER:
2 OF 38

ABBREVIATIONS

ALT – ALTERNATE (– ALTERNATED)
AB – AGGREGATE BASE
AC – ASPHALT CONCRETE
ACI – AMERICAN CONCRETE INSTITUTE
ALIGN – ALIGNMENT (– ALIGN)
AMP – AMPERE
APPROX – APPROXIMATE (– APPROXIMATELY)
AVRD – AVERAGE
ABUT – ABUTMENT
ASSY – ASSEMBLY
ACP – ASBESTOS CEMENT PIPE
ASPH – ASPHALT
AP – ACCESS POINT

BP – BEGIN POINT
BC – BEGIN CURVE
BF – BOTH FACES
BKFL – BANKFULL
BM – BENCH MARK
BRNG – BEARING
BR – BRIDGE
BW – BARBED WIRE
BK – BANK
BLDG – BUILDING
BIT – BITUMINOUS
BOT – BOTTOM
BV – BLACK VINYL

C – CURVE, – CHORD
CB – CATCH BASIN
CCM – CELLULAR CONCRETE MAT
CCP – CONCRETE – CYLINDER PIPE
CF – CUBIC FEET
CFM – CUBIC FEET PER MINUTE
CFS – CUBIC FEET PER SECOND
CIP – CAST IRON PIPE
CJ – CONSTRUCTION JOINT
CLR – CLEAR (– CLEARANCE)
CL-6 – CHAIN LINK FENCE (NUMBER = HEIGHT)
CM – CENTIMETER
CMP – CORRUGATED METAL PIPE
CONC – CONCRETE
CONST – CONSTRUCT (CONSTRUCTION)
CONT – CONTINUOUS (– CONTROL)
CY – CUBIC YARDS
CYL – CYLINDER
COL – COLUMN
CRK – CREEK
CSJ – CITY OF SAN JOSE

DEG (°) – DEGREES
DI – DROP INLET
DIA – DIAMETER
DIP – DUCTILE IRON PIPE
DR – DRIVE
D/S – DOWNSTREAM
DBL – DOUBLE
DWG – DRAWING (– DRAWINGS)
DWN – DOWN
DET – DETAIL

E – EAST, ELECTRIC
(E) – EXISTING
EJ – EXPANSION JOINT
EA – EACH
EB – ELECTRICAL BOX
EC – END CURVE
EL – ELEVATION
ELECT – ELECTRIC (ELECTRICAL)
ELEV – ELEVATION
EM – ELECTRIC METER
ENGR – ENGINEER (ENGINEERING)
EP – EDGE OF PAVEMENT
EXIST – EXISTING
EXPWY – EXPRESSWAY
E'LY – EASTERLY
RWU – EQUATION

FD – FOUND
FF – FAR – FACE
FG – FINISH GRADE
FH – FIRE HYDRANT
FT (') – FEET (– FOOT)
FTG – FOOTING
FWY – FREEWAY
FB – FREEBOARD

G – GAS
GA – GAUGE (GAGE)
GAL – GALVANIZE (GALVANIZED)
GB – GUY ANCHOR AND POLE
GB – GRADE BREAK
GFI – GROUND FAULT INTERRUPTER
GL – GRADING LIMIT
GM – GAS METER
GPM – GALLONS PER MINUTE

GPS – GALLONS PER SECOND
GR – GRADE
GRND – GROUND
GRP – GROUP
GP – GUY POLE

H – HEIGHT
H&T – HUB AND TACK
HORIZ – HORIZONTAL
HP – HORSEPOWER, HINGEPOINT
HWY – HIGHWAY
HK – HOOK (APPLIED TO REBAR)

I – IRRIGATION
ID – INSIDE DIAMETER (DIMENSION)
IF – INSIDE FACE
IN (") – INCH (INCHES)
INV – INVERT
IP – IRON PIPE

JP – JOINT POLE
JT – JOINT
JUNCT – JUNCTION

K – KILO
Km – KILOMETER
KV – KILOVOLT
Kw – KILOWATT

LB – LEFT BANK
LF – LINEAR FEET
L – LENGTH (LONG)
LN – LANE
LT – LEFT
LP – LIP OF GUTTER

m – METER
MAINT – MAINTENANCE
MAX – MAXIMUM
MFP – MODIFIED FLOOD PLAIN
MH – MANHOLE
MIN – MINIMUM
MON – MONUMENT
MATL – MATERIAL(S)
MEMB – MEMBER
MTL – METAL

NGVD – NATIONAL GEODETIC VERTICAL DATUM
N – NORTH
(N) – NEW
N/A – NOT APPLICABLE,NOT AVAILABLE
NE – NORTHEAST
NE'LY – NORTHEASTERLY
NF – NEAR FACE
NIC – NOT IN CONTRACT
NPDES – NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

NTS – NOT TO SCALE
NW – NORTHWEST
NW'LY – NORTHWESTERLY
N'LY – NORTHERLY

OC – ON CENTER
OD – OUTSIDE DIAMETER (DIMENSION)
OF – OUTSIDE FACE
OH – OVERHEAD
OPNG – OPENING

℘ – PROPERTY LINE
PB – PULL BOX
PCC – PORTLAND CEMENT CONCRETE COMPOUND CURVE
PI – POINT OF INTERSECTION
POB – POINT OF BEGINING
POT – POINT OF TANGENT
PP – POWER POLE
PRC – POINT OF REVERSE CURVE
PSI – POUNDS PER SQUARE INCH
PT – POINT
PVC – POLYVINYL CHLORIDE (PIPE)
PVMT – PAVEMENT
PED – PEDESTRIAN

Q – DESIGN DISCHARGE (CFS)

R – RADIUS
RB – RIGHT BANK
RC – REINFORCED CONCRETE
RCB – REINFORCED CONCRETE BOX
RCP – REINFORCED CONCRETE PIPE
RD – ROAD

RCP – REINFORCING STEEL BAR
REINF – REINFORCEMENT (REINFORCING)
REQ'D – REQUIRED
RP – RADIUS POINT
RT – RIGHT
RTE – ROUTE
RR – RAILROAD
R/W – RIGHT OF WAY
REF – REFERENCE (REFER)

S – SOUTH, SLOPE
SCRR – SACK CONCRETE RIP-RAP
SCSP – SACKED CONCRETE SLOPE PROTECTION
SCH – SCHEDULE
SCVWD – SANTA CLARA VALLEY WATER DISTRICT
SD – STORM DRAIN, STANDARD DETAIL
SE – SOUTHEAST
SEC (") – SECONDS
SECT – SECTION
SE'LY – SOUTHEASTERLY
SHT – SHEET
SPECS – SPECIFICATIONS
SQ FT – SQUARE FEET
SS – SANITARY SEWER
SSCO – SANITARY SEWER CLEANOUT
STA – STATION
STD – STANDARD
STL – STEEL
STR – STRUCTURE
SW'LY – SOUTHWESTERLY
SY – SQUARE YARDS
SYM – SYMMETRICAL
SW – SOUTHWEST
S'LY – SOUTHERLY

T – TANGENT
TEL – TELEPHONE
TBM – TEMPORARY BENCH MARK
TC – TOP OF CURB
TCA – TEMPORARY CONSTRUCTION AREA
TFC – TRAFFIC
THK – THICK
TOB – TOP OF BANK
TOC – TOE OF CHANNEL
TP – TELEPHONE POLE, TURNING POINT
TP-1 – TEST PIT (NUMBER=DESIGNATION/LOCATION
TS – TRAFFIC SIGNAL
TV – TELEVISION (CABLE OR FACILITY)
TW – TOP OF WALL
TYP – TYPICAL

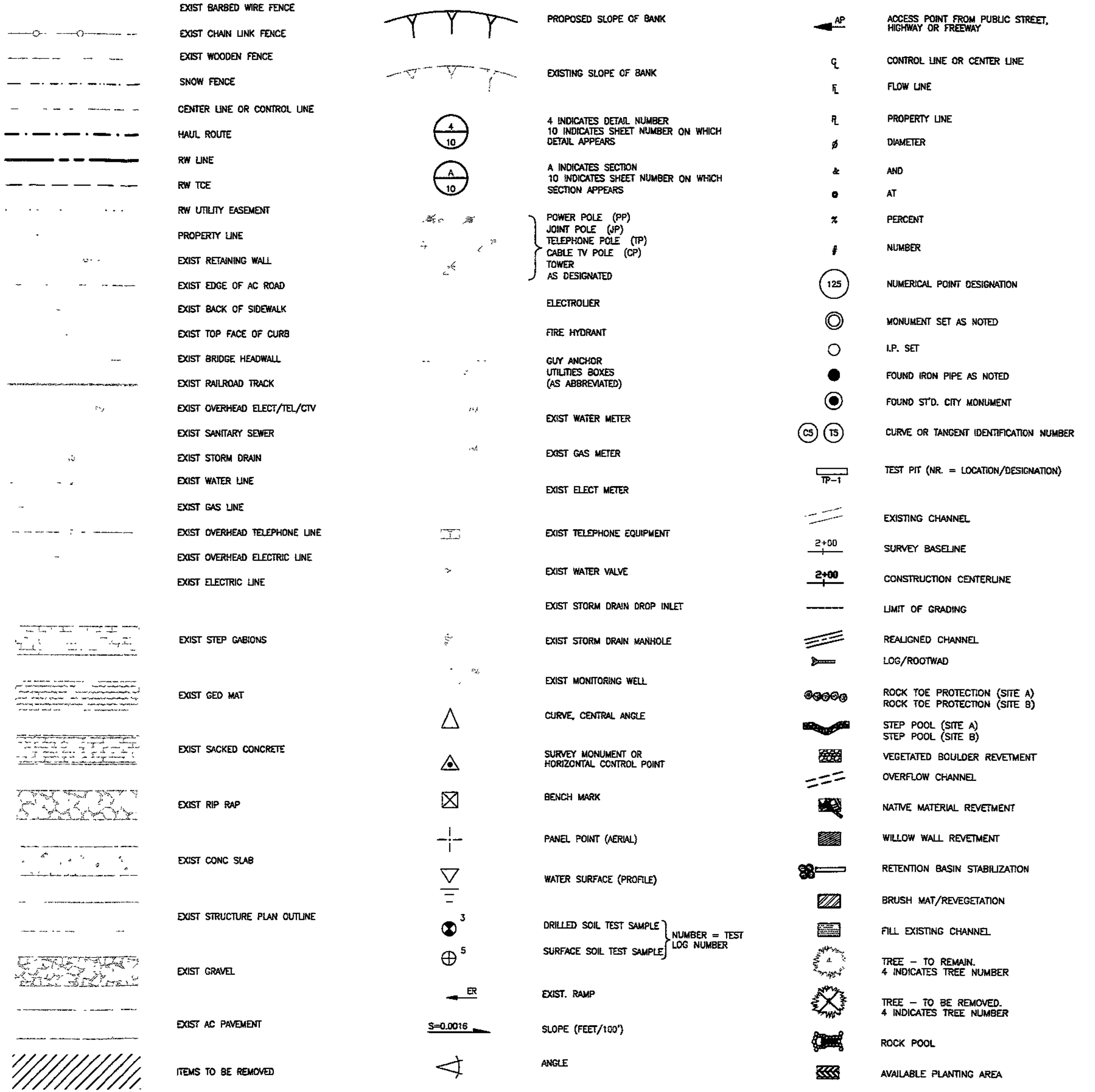
UB – UTILITY BOX
UC – UTILITY CONDUIT
UG – UNDERGROUND
U/S – UPSTREAM
USC&GS – UNITED STATES COASTAL AND GEODETIC SURVEY

V – VOLTS
VCP – VITRIFIED CLAY PIPE
VERT – VERTICAL

W – WITH, WATER, WEST, WIDTH, (WIDE)
W/O – WITHOUT
WM – WATER METER
WS – WATER SURFACE
WT – WEIGHT
WD – WOOD (WOODEN)
WSP – WATER SURFACE PROFILE
WV – WATER VALVE
WW – WING WALL
WWF – WELDED WIRE FABRIC
W'LY – WESTERLY

X-SECT – CROSS SECTION
Y – YARDS
Z – ZONE

LEGEND



EXIST BARBED WIRE FENCE
EXIST CHAIN LINK FENCE
EXIST WOODEN FENCE
SNOW FENCE
CENTER LINE OR CONTROL LINE
HAUL ROUTE
RW LINE
RW TCE
RW UTILITY EASEMENT
PROPERTY LINE
EXIST RETAINING WALL
EXIST EDGE OF AC ROAD
EXIST BACK OF SIDEWALK
EXIST TOP FACE OF CURB
EXIST BRIDGE HEADWALL
EXIST RAILROAD TRACK
EXIST OVERHEAD ELECT/TEL/CTV
EXIST SANITARY SEWER
EXIST STORM DRAIN
EXIST WATER LINE
EXIST GAS LINE
EXIST OVERHEAD TELEPHONE LINE
EXIST OVERHEAD ELECTRIC LINE
EXIST ELECTRIC LINE
EXIST STEP GABIONS
EXIST GEO MAT
EXIST SACKED CONCRETE
EXIST RIP RAP
EXIST CONC SLAB
EXIST STRUCTURE PLAN OUTLINE
EXIST GRAVEL
EXIST AC PAVEMENT
ITEMS TO BE REMOVED

PROPOSED SLOPE OF BANK
EXISTING SLOPE OF BANK
4 INDICATES DETAIL NUMBER
10 INDICATES SHEET NUMBER ON WHICH DETAIL APPEARS
A INDICATES SECTION
10 INDICATES SHEET NUMBER ON WHICH SECTION APPEARS
POWER POLE (PP)
JOINT POLE (JP)
TELEPHONE POLE (TP)
CABLE TV POLE (CP)
TOWER
AS DESIGNATED
ELECTROLIER
FIRE HYDRANT
GUY ANCHOR
UTILITIES BOXES
(AS ABBREVIATED)
EXIST WATER METER
EXIST GAS METER
EXIST ELECT METER
EXIST TELEPHONE EQUIPMENT
EXIST WATER VALVE
EXIST STORM DRAIN DROP INLET
EXIST STORM DRAIN MANHOLE
EXIST MONITORING WELL
CURVE, CENTRAL ANGLE
SURVEY MONUMENT OR HORIZONTAL CONTROL POINT
BENCH MARK
PANEL POINT (AERIAL)
WATER SURFACE (PROFILE)
DRILLED SOIL TEST SAMPLE
SURFACE SOIL TEST SAMPLE
NUMBER = TEST LOG NUMBER
EXIST. RAMP
SLOPE (FEET/100')
ANGLE

ACCESS POINT FROM PUBLIC STREET, HIGHWAY OR FREEWAY
℄ CONTROL LINE OR CENTER LINE
FLOW LINE
PROPERTY LINE
Ø DIAMETER
& AND
@ AT
% PERCENT
# NUMBER
NUMERICAL POINT DESIGNATION
◎ MONUMENT SET AS NOTED
○ I.P. SET
● FOUND IRON PIPE AS NOTED
⦿ FOUND ST'D. CITY MONUMENT
CURVE OR TANGENT IDENTIFICATION NUMBER
TEST PIT (NR. = LOCATION/DESIGNATION)
EXISTING CHANNEL
SURVEY BASELINE
CONSTRUCTION CENTERLINE
LIMIT OF GRADING
REALIGNED CHANNEL
LOG/ROOTWAD
ROCK TOE PROTECTION (SITE A)
ROCK TOE PROTECTION (SITE B)
STEP POOL (SITE A)
STEP POOL (SITE B)
VEGETATED BOULDER REVETMENT
OVERFLOW CHANNEL
NATIVE MATERIAL REVETMENT
WILLOW WALL REVETMENT
RETENTION BASIN STABILIZATION
BRUSH MAT/REVEGETATION
FILL EXISTING CHANNEL
TREE – TO REMAIN.
4 INDICATES TREE NUMBER
TREE – TO BE REMOVED.
4 INDICATES TREE NUMBER
ROCK POOL
AVAILABLE PLANTING AREA

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

DATE
07-10-08
DESIGN
K.N.
DRAWN
J. FORD
CHECKED
D.M.

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
No. C[illegible]
Exp. 09/30/09
CIVIL
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 1 – RECOMMENDED PROJECT
ABBREVIATIONS, LEGEND & SYMBOLS

SCALE
NOT TO SCALE
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002
SHEET CODE:
G-3
PAGE NUMBER:
3 OF 38

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LINE TABLE

LINE	LENGTH	BEARING
L1	163.31	N76°24'15"W
L2	83.73	N13°22'08"W
L3	94.27	N71°55'01"W
L4	36.91	N84°06'30"W
L5	107.02	N32°08'39"W
L6	48.90	N55°08'33"W
L7	57.27	N24°39'50"W
L8	11.53	S74°23'36"W
L9	22.10	N37°04'49"W
L10	111.83	N16°03'08"E
L11	39.00	N35°03'48"W
L12	76.60	N19°43'45"E
L13	36.57	N35°21'44"W
L14	34.42	N26°34'23"E
L15	58.63	N39°52'02"E
L16	42.21	N42°39'39"E
L17	25.22	N27°16'03"E

CURVE TABLE

CURVE	RADIUS	LENGTH	DELTA
C1	11.45	12.60	63°02'11"
C2	79.27	81.00	58°32'54"
C3	221.11	47.05	12°11'28"
C4	89.74	66.20	42°15'56"
C5	66.16	43.02	37°15'30"
C6	134.56	110.28	46°57'25"
C7	208.57	190.02	52°11'55"
C8	226.87	201.49	50°53'09"
C9	175.00	66.23	21°41'08"
C10	50.00	18.94	21°41'54"
C11	40.00	36.43	52°10'38"
C12	63.96	35.92	32°10'28"
C13	9.83	19.41	113°07'00"
C14	25.22	30.16	68°31'36"
C15	39.12	31.50	46°08'14"
C16	78.80	75.41	54°50'01"
C17	53.52	57.75	61°49'46"
C18	97.69	32.00	18°46'02"
C19	226.87	54.72	13°49'08"
C20	24.25	19.54	46°10'03"

CURVE TABLE

CURVE	RADIUS	LENGTH	DELTA
C21	77.93	58.01	42°39'08"
C22	33.07	38.38	66°29'47"
C23	62.35	66.37	60°59'26"
C24	85.31	44.73	30°02'32"
C25	31.61	30.39	55°05'29"
C26	8.11	16.34	115°21'48"
C27	18.92	18.92	57°17'27"
C28	34.28	21.92	36°38'05"
C29	35.96	20.57	32°46'19"
C30	98.98	22.97	13°17'40"
C31	98.98	47.13	27°16'58"
C32	83.88	35.85	24°29'21"
C33	56.58	15.20	15°23'36"
C34	59.23	40.56	39°14'01"
C35	12.37	14.46	66°58'23"
C36	68.12	39.01	32°49'02"
C37	245.18	44.92	10°29'47"

POINT TABLE

POINT	NORTHING	EASTING	DESCRIPTION
100	1883920.2073	6170503.6672	BP
102	1883954.5575	6170344.1908	BC
103	1883963.0388	6170335.7430	EC
104	1884044.4998	6170316.3831	BC
105	1884101.5269	6170263.8650	EC
106	1884130.7870	6170174.2531	BC
107	1884151.9831	6170129.3200	EC
108	1884144.3290	6170091.6021	BC
109	1884173.7292	6170033.9618	PRC
110	1884194.5615	6169997.1829	PRC
111	1884255.1010	6169908.6921	EC
112	1884345.7197	6169851.7496	BC
113	1884442.3057	6169695.7070	PRC
114	1884542.9933	6169528.7953	PRC
115	1884590.1147	6169482.8118	EC
116	1884618.0624	6169442.6863	BC
117	1884625.7207	6169425.4923	PRC
118	1884647.9787	6169398.2476	EC
119	1884700.0243	6169374.3490	BC
120	1884735.0769	6169369.0622	PRC

POINT TABLE

POINT	NORTHING	EASTING	DESCRIPTION
121	1884745.8295	6169356.6717	EC
122	1884742.7264	6169345.5624	BC
123	1884751.8102	6169318.6583	EC
124	1884769.4408	6169305.3341	BC
125	1884799.1857	6169297.9112	PRC
126	1884868.0605	6169275.0528	PRC
127	1884921.2121	6169260.9477	EC
128	1885028.6801	6169291.8699	BC
129	1885060.3209	6169295.5693	PRC
130	1885114.7589	6169299.5617	PRC
131	1885133.3631	6169295.6141	EC
132	1885165.2819	6169273.2118	BC
133	1885196.6587	6169226.0050	PRC
134	1885222.5390	6169200.6016	PCC
135	1885282.2707	6169221.4915	PRC
136	1885318.6059	6169246.6984	EC
137	1885390.7048	6169272.5549	BC
138	1885419.6698	6169268.5787	EC
139	1885449.4895	6169247.4166	BC
140	1885462.1748	6169252.6242	PRC

POINT TABLE

POINT	NORTHING	EASTING	DESCRIPTION
141	1885473.5032	6169266.7926	PRC
142	1885489.7590	6169280.9373	PRC
143	1885504.6093	6169294.7656	EC
144	1885535.3946	6169310.1637	BC
145	1885554.5637	6169322.7172	EC
146	1885599.5603	6169360.2967	BC
147	1885627.3246	6169397.8296	PRC
148 .	1885647.7793	6169426.9395	EC
149	1885678.8174	6169455.5414	BC
150	1885691.2377	6169464.2267	EC
151	1885713.6538	6169475.7804	BC
152	1885740.8364	6169504.8123	PRC
153	1885752.2817	6169512.2490	PCC
154	1885789.1067	6169501.0743	PCC
155	1885824.1910	6169473.1296	EP
156	1883965.6860	6170346.8820	RP
157	1884026.1707	6170239.2596	RP
158	1883920.5966	6170105.6216	RP
159	1884233.5912	6170100.8134	RP
160	1884129.5940	6169984.6733	RP

POINT TABLE

POINT	NORTHING	EASTING	DESCRIPTION
161	1884326.6932	6170022.6246	RP
162	1884234.7470	6169675.1472	RP
163	1884668.0675	6169718.0700	RP
164	1884446.5138	6169382.7929	RP
165	1884577.0336	6169414.1094	RP
166	1884664.6703	6169434.5986	RP
167	1884726.7166	6169432.4777	RP
168	1884736.3617	6169359.3163	RP
169	1884767.0154	6169338.7778	RP
170	1884793.0278	6169336.5438	RP
171	1884811.5897	6169220.0930	RP
172	1884906.4134	6169312.3793	RP
173	1885055.6934	6169197.9869	RP
174	1885071.0672	6169522.1813	RP
175	1885119.4299	6169275.7623	RP
176	1885120.5121	6169209.4238	RP
177	1885228.9735	6169233.0416	RP
178	1885234.6695	6169261.7583	RP
179	1885347.4056	6169166.3925	RP
180	1885401.3756	6169242.8001	RP

POINT TABLE

POINT	NORTHING	EASTING	DESCRIPTION
181	1885454.1849	6169254.0329	RP
182	1885480.8078	6169249.3391	RP
183	1885460.2679	6169298.4166	RP
184	1885520.6977	6169262.6001	RP
185	1885491.1191	6169398.6839	RP
186	1885536.1157	6169436.2642	RP
187	1885704.6186	6169365.2588	RP
188	1885717.1604	6169413.9325	RP
189	1885686.5174	6169528.4298	RP
190	1885752.1797	6169499.8803	RP
191	1885751.7204	6169444.1357	RP
192	1885654.5352	6169296.1247	RP

REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

DATE	07-10-08
DESIGN	K.N.
DRAWN	L. PENILL
CHECKED	D.M.

ENGINEERING CERTIFICATION

MICHAEL STUART THOMAS
Exp. 09/30/09
CIVIL

07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

PROJECT ENGINEER 07/10/08
MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 – RECOMMENDED PROJECT

SURVEY LAYOUT TABLE

SCALE
AS SHOWN

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002

SHEET CODE:
G-4

PAGE NUMBER:
4 OF 38

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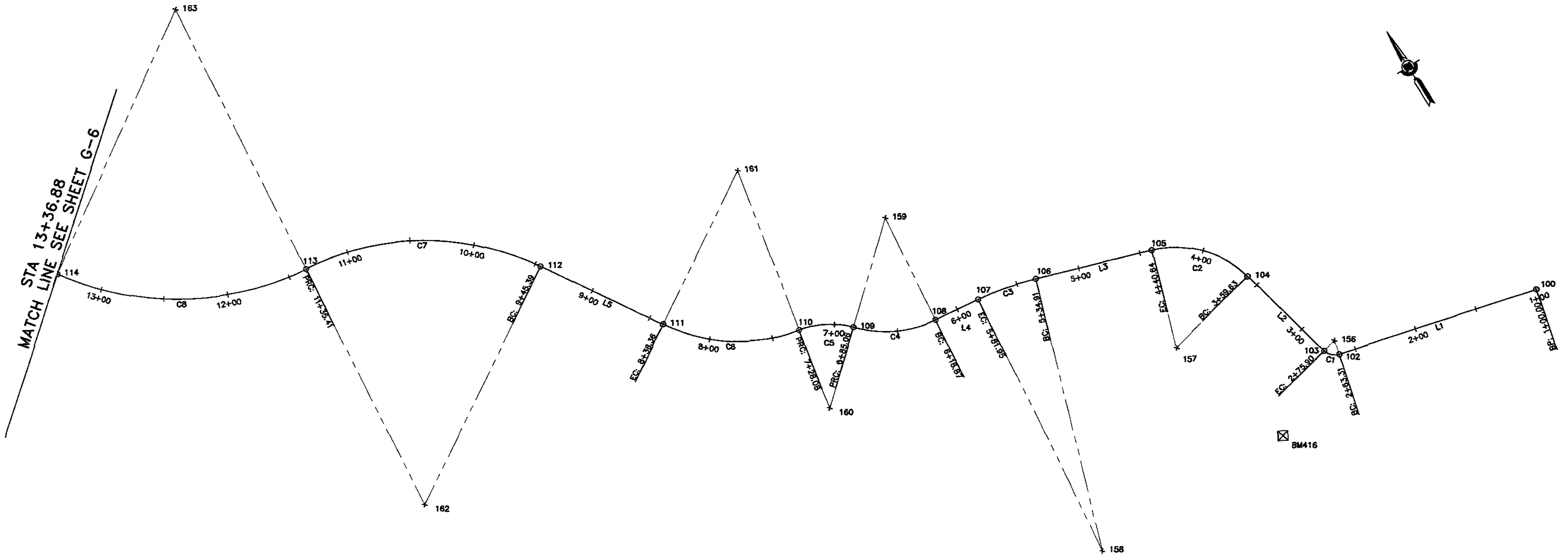


BENCHMARK POINTS TABLE

BM #	NORTHING	EASTING	STATION	DESCRIPTION
416	1883923	6170273	619.96 (88)	BRASS DISK MONUMENT BOX; AT THE INTERSECTION OF EAST BOUND HICKS ROAD AND ALAMITOS ROAD; APPROXIMATELY 55 FEET SOUTHEAST OF THE INTERSECTION; SANTA CLARA COUNTY.

REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

1. SEE SHEET G-4 FOR SURVEY LAYOUT TABLE

DATE	07-10-08
DESIGN	K.N.
DRAWN	L. PENILL
CHECKED	D.M.

ENGINEERING CERTIFICATION

MICHAEL STUART THOMAS
No. C49957
Exp. 09/30/09
CIVIL

07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 – RECOMMENDED PROJECT

SURVEY LAYOUT

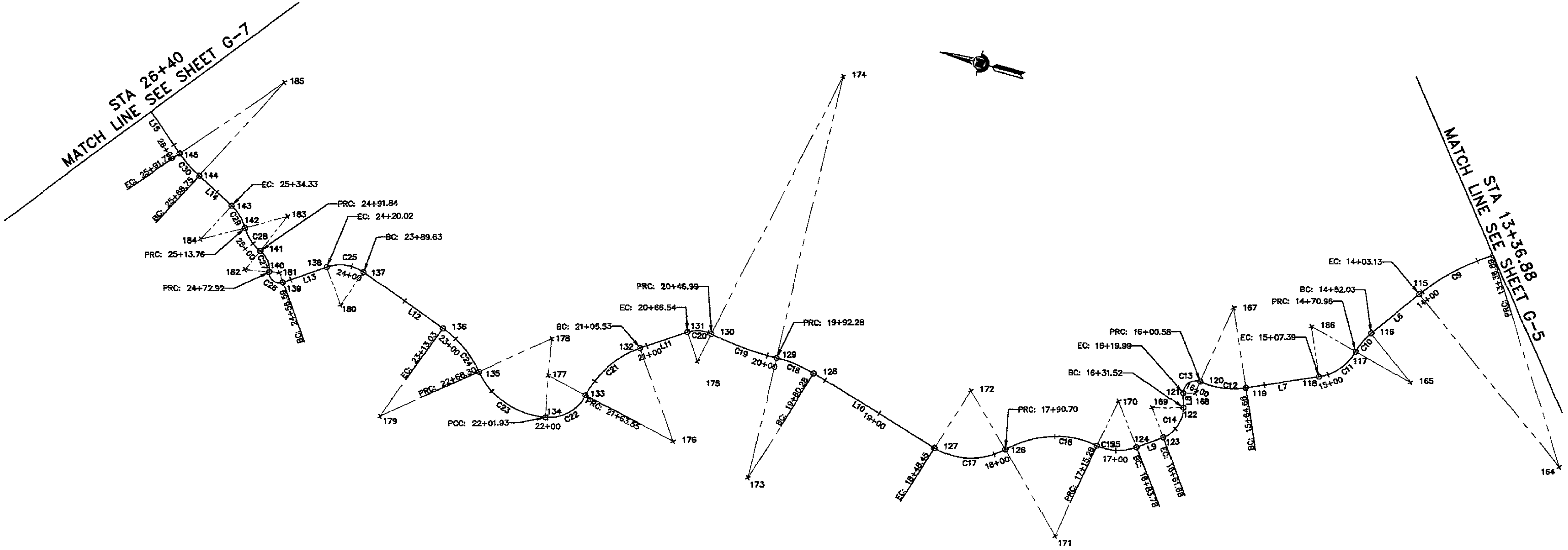
SCALE
1" = 40'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002

SHEET CODE:
G-5

PAGE NUMBER:
5 OF 38



REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

1. SEE SHEET G-4 FOR SURVEY LAYOUT TABLE

DATE 07-10-08

DESIGN K.N.

DRAWN L. PENILL

CHECKED D.M.

ENGINEERING CERTIFICATION

MICHAEL STUART THOMAS

No. [illegible]57

Exp. 09/30/09

CIVIL

PROJECT ENGINEER 07/10/08 DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

PROJECT ENGINEER 07/10/08 MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT

SURVEY LAYOUT

SCALE 1" = 40'

VERIFY SCALES

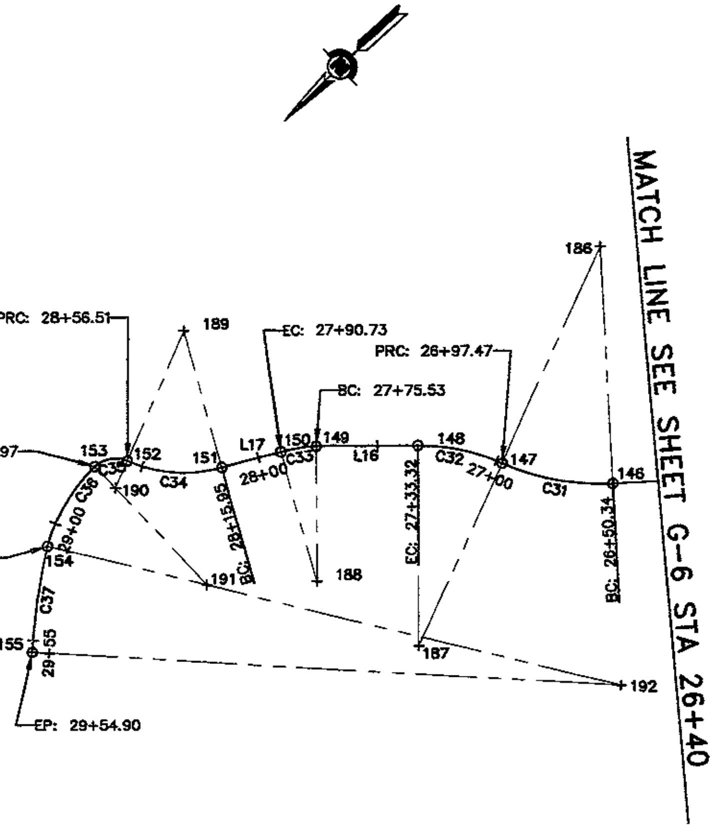
0 1"

BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002

SHEET CODE: G-6

PAGE NUMBER: 6 OF 38



REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

1. SEE SHEET G-4 FOR SURVEY LAYOUT TABLE

DATE 07-10-08

DESIGN K.N.

DRAWN L. PENILL

CHECKED D.M.

ENGINEERING CERTIFICATION

MICHAEL STUART THOMAS

Exp. 09/30/09

CIVIL

PROJECT ENGINEER 07/10/08 DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

PROJECT ENGINEER 07/10/08 MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 – RECOMMENDED PROJECT

SURVEY LAYOUT

SCALE 1" = 40'

VERIFY SCALES

0 1"

BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002

SHEET CODE: G-7

PAGE NUMBER: 7 OF 38

K:\Active Projects\WP-91854002\Jacques_Gulch\sheets\G-07.dwg 7-18-08 02:53:17 PM holmesb

NO.	TREE DESCRIPTION	TREE TO BE REMOVED
1	18" CALIFORNIA BAY	
2	10" CALIFORNIA BAY	
3	8" CALIFORNIA BAY	
4	10" CALIFORNIA BAY	
5	10" WESTERN SYCAMORE	
6	5" WESTERN SYCAMORE	
7	10" WHITE ALDER	
8	15" WHITE ALDER	
9	12" CALIFORNIA BAY	
10	50" WESTERN SYCAMORE	
11	10" BLUE OAK	
12	14" CALIFORNIA BAY	
13	12" CALIFORNIA BAY	
14	16" CALIFORNIA BAY	
15	8" BIGLEAF MAPLE	
16	14" CALIFORNIA BAY	
17	8" CALIFORNIA BAY	
18	10" CALIFORNIA BAY	
19	14" CALIFORNIA BAY	
20	14" CALIFORNIA BAY	
21	12" CALIFORNIA BAY	
22	20" CALIFORNIA BAY	
23	10" BIGLEAF MAPLE	
24	10" BIGLEAF MAPLE	
25	8" CALIFORNIA BAY	
26	18" CALIFORNIA BAY	
27	40" CALIFORNIA BAY	
28	10" CALIFORNIA BAY	
29	14" WILLOW	
30	32" WESTERN SYCAMORE	
31	24" WESTERN SYCAMORE	
32	18" CALIFORNIA BAY	
33	14" CALIFORNIA BAY	
34	8" CALIFORNIA BAY	
35	10" CALIFORNIA BAY	
36	10" CALIFORNIA BAY	
37	10" BLUE OAK	
38	12" CALIFORNIA BAY	
39	8" CALIFORNIA BAY	
40	8" COAST LIVE OAK	
41	4" COAST LIVE OAK	
42	24" BLUE OAK	
43	13" WHITE ALDER	
44	12" WILLOW	
45	8" WILLOW	YES (SITE A)
46	6" WILLOW	YES (SITE A)
47	8" WILLOW	
48	10" VALLEY OAK	
49	16" CALIFORNIA BAY	
50	8" WILLOW	YES (SITE A)
51	10" COAST LIVE OAK	
52	14" VALLEY OAK	
53	14" VALLEY OAK	
54	14" BLUE OAK	
55	26" VALLEY OAK	
56	4" VALLEY OAK	
57	4" VALLEY OAK	
58	36" WILLOW	
59	16" VALLEY OAK	
60	6" VALLEY OAK	
61	8" BLUE ELDERBERRY	
62	30" WILLOW	
63	24" WILLOW	
64	20" WILLOW	
65	5" BLUE ELDERBERRY	
66	10" BLUE ELDERBERRY	
67	35" WILLOW	
68	10" WILLOW	
69	12" CALIFORNIA BAY	
70	16" CALIFORNIA BAY	
71	18" CALIFORNIA BAY	
72	14" VALLEY OAK	
73	10" VALLEY OAK	
74	24" COAST LIVE OAK	
75	18" CALIFORNIA BAY	
76	14" VALLEY OAK	
77	12" CALIFORNIA BAY	
78	10" COAST LIVE OAK	
79	10" COAST LIVE OAK	
80	14" VALLEY OAK	
81	14" VALLEY OAK	
82	14" CALIFORNIA BAY	
83	10" CALIFORNIA BAY	
84	10" CALIFORNIA BAY	
85	10" CALIFORNIA BAY	
86	20" VALLEY OAK	
87	20" VALLEY OAK	
88	10" WESTERN SYCAMORE	
89	12" COAST LIVE OAK	
90	10" CALIFORNIA BAY	
91	14" VALLEY OAK	
92	10" CALIFORNIA BAY	
93	10" CALIFORNIA BAY	
94	10" CALIFORNIA BAY	
95	10" CALIFORNIA BAY	
96	10" CALIFORNIA BAY	
97	10" CALIFORNIA BAY	
98	20" VALLEY OAK	
99	20" COAST LIVE OAK	
100	20" VALLEY OAK	
101	10" CALIFORNIA BUCKEYE	
102	12" DEAD OAK	
103	10" CALIFORNIA BAY	
104	12" VALLEY OAK	
105	12" VALLEY OAK	
106	10" WESTERN SYCAMORE	
107	16" VALLEY OAK	
108	20" VALLEY OAK	
109	12" VALLEY OAK	
110	8" CALIFORNIA BAY x 2	YES (SITE B)
111	8" CALIFORNIA BAY	YES (SITE B)
112	10" CALIFORNIA BAY	
113	10" CALIFORNIA BAY	
114	10" CALIFORNIA BAY	
115	10" CALIFORNIA BAY	
116	10" CALIFORNIA BAY	
117	117" CALIFORNIA BAY	
118	10" CALIFORNIA BAY	
119	20" WESTERN SYCAMORE	
120	8" VALLEY OAK	
121	6" CALIFORNIA BAY	
122	6" CALIFORNIA BAY	
123	10" COAST LIVE OAK	
124	14" COAST LIVE OAK	
125	14" COAST LIVE OAK	
126	14" COAST LIVE OAK	
127	10" CALIFORNIA BAY	
128	8" CALIFORNIA BUCKEYE	
129	18" WESTERN SYCAMORE	
130	10" VALLEY OAK	
131	12" BLUE OAK	
132	15" CALIFORNIA BAY	
133	5" COAST LIVE OAK	YES (SITE B)
134	4" CALIFORNIA BAY x 2	YES (SITE B)
135	15" CALIFORNIA BAY	
136	7" COAST LIVE OAK	YES (SITE B)
137	4" CALIFORNIA BAY	YES (SITE B)
138	16" COAST LIVE OAK	
139	16" BLUE OAK	
140	20" VALLEY OAK	
141	10" CALIFORNIA BAY	
142	10" COAST LIVE OAK	
143	10" VALLEY OAK	
144	16" VALLEY OAK	
145	8" COAST LIVE OAK	
146	10" CALIFORNIA BAY	
147	10" CALIFORNIA BAY	
148	10" CALIFORNIA BAY	
149	16" COAST LIVE OAK	
150	16" COAST LIVE OAK	
151	16" VALLEY OAK	
152	16" VALLEY OAK	
153	12" VALLEY OAK	
154	16" VALLEY OAK	
155	12" CALIFORNIA BAY	
156	4" COAST LIVE OAK	
157	6" CALIFORNIA BAY	
158	6" CALIFORNIA BAY	
159	8" VALLEY OAK	
160	10" COAST LIVE OAK	
161	12" VALLEY OAK	
162	12" VALLEY OAK	
163	10" VALLEY OAK	
164	12" COAST LIVE OAK	
165	12" VALLEY OAK	
166	60" WESTERN SYCAMORE	
167	14" WESTERN SYCAMORE	
168	17" VALLEY OAK	YES (SITE B)
169	44" VALLEY OAK	
170	6" VALLEY OAK	
171	36" COAST LIVE OAK	
172	24" WESTERN SYCAMORE	
173	80" WESTERN SYCAMORE	
174	14" COAST LIVE OAK	
175	42" BLUE OAK	
176	34" VALLEY OAK	
177	72" WESTERN SYCAMORE	
178	10" CALIFORNIA BAY	
179	8" CALIFORNIA BUCKEYE	
180	8" WESTERN SYCAMORE	
181	26" WESTERN SYCAMORE	
182	12" COAST LIVE OAK	
183	40" COAST LIVE OAK	
184	8" CALIFORNIA BAY	
185	8" CALIFORNIA BAY	
186	17" CALIFORNIA BAY	
187	18" WESTERN SYCAMORE	
188	18" WESTERN SYCAMORE	
189	18" WESTERN SYCAMORE	
190	8" CALIFORNIA BAY	
191	96" WESTERN SYCAMORE	
192	18" WESTERN SYCAMORE	
193	18" WESTERN SYCAMORE	
194	8" COAST LIVE OAK	
195	8" COAST LIVE OAK	
196	28" WESTERN SYCAMORE	
197	12" COAST LIVE OAK	
198	18" COAST LIVE OAK	
199	18" COAST LIVE OAK	
200	8" BIGLEAF MAPLE	
201	10" CALIFORNIA BAY	
202	42" COAST LIVE OAK	
203	40" COAST LIVE OAK	

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

DATE 07-10-08
DESIGN K.N.
DRAWN J. FORD
CHECKED D.M.

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 09/30/09
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

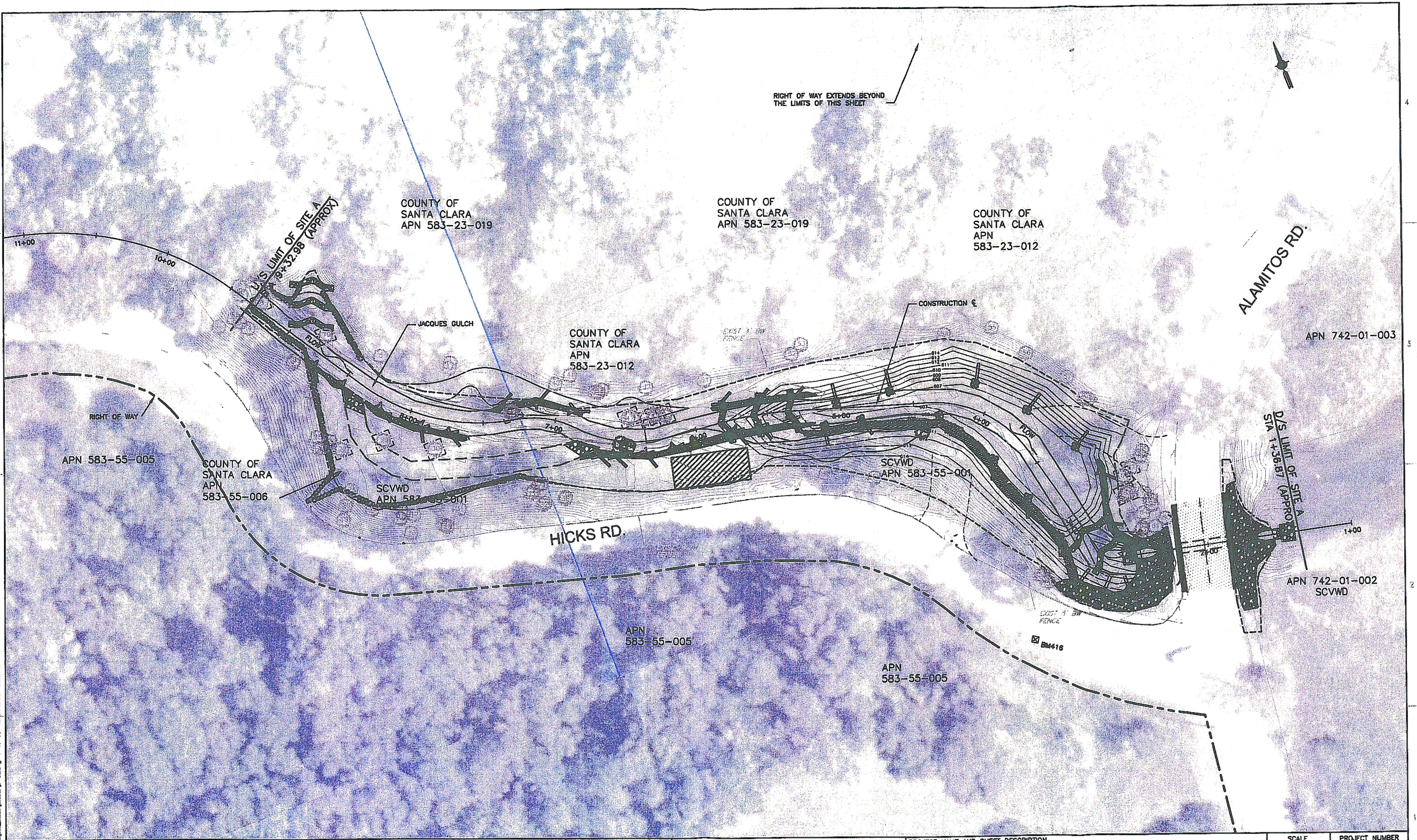
PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT TREE TABLE

SCALE: NOT TO SCALE
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 91854002
SHEET CODE: D-1
PAGE NUMBER: 8 OF 38


RIGHT OF WAY EXTENDS BEYOND THE LIMITS OF THIS SHEET
COUNTY OF SANTA CLARA APN 583-23-019
COUNTY OF SANTA CLARA APN 583-23-019
COUNTY OF SANTA CLARA APN 583-23-012
COUNTY OF SANTA CLARA APN 583-23-012
ALAMITOS RD.
APN 742-01-003
U/S LIMIT OF SITE A 9+32.98 (APPROX)
11+00
10+00
JACQUES GULCH
CONSTRUCTION ℄
EXIST 4' BW FENCE
FLOW
RIGHT OF WAY
APN 583-55-005
COUNTY OF SANTA CLARA APN 583-55-006
SCVWD APN 583-55-001
SCVWD APN 583-55-001
8+00
7+00
6+00
5+00
4+00
3+00
2+00
1+00
FLOW
D/S LIMIT OF SITE A STA 1+36.87 (APPROX)
APN 742-01-002 SCVWD
HICKS RD.
EXIST 5' BW FENCE
BM416
APN 583-55-005
APN 583-55-005

REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

1. SEE SHEET D-1 FOR TREE TABLE

DATE 07-10-08
DESIGN K.N.
DRAWN L.P.
CHECKED D.M.

ENGINEERING CERTIFICATION
REGISTERED PROFESSIONAL ENGINEER MICHAEL STUART THOMAS No. [illegible]57 Exp. [illegible]/30/09 CIVIL STATE OF CALIFORNIA
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONSTRUCTION RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT

SITE A TREE REMOVAL PLAN

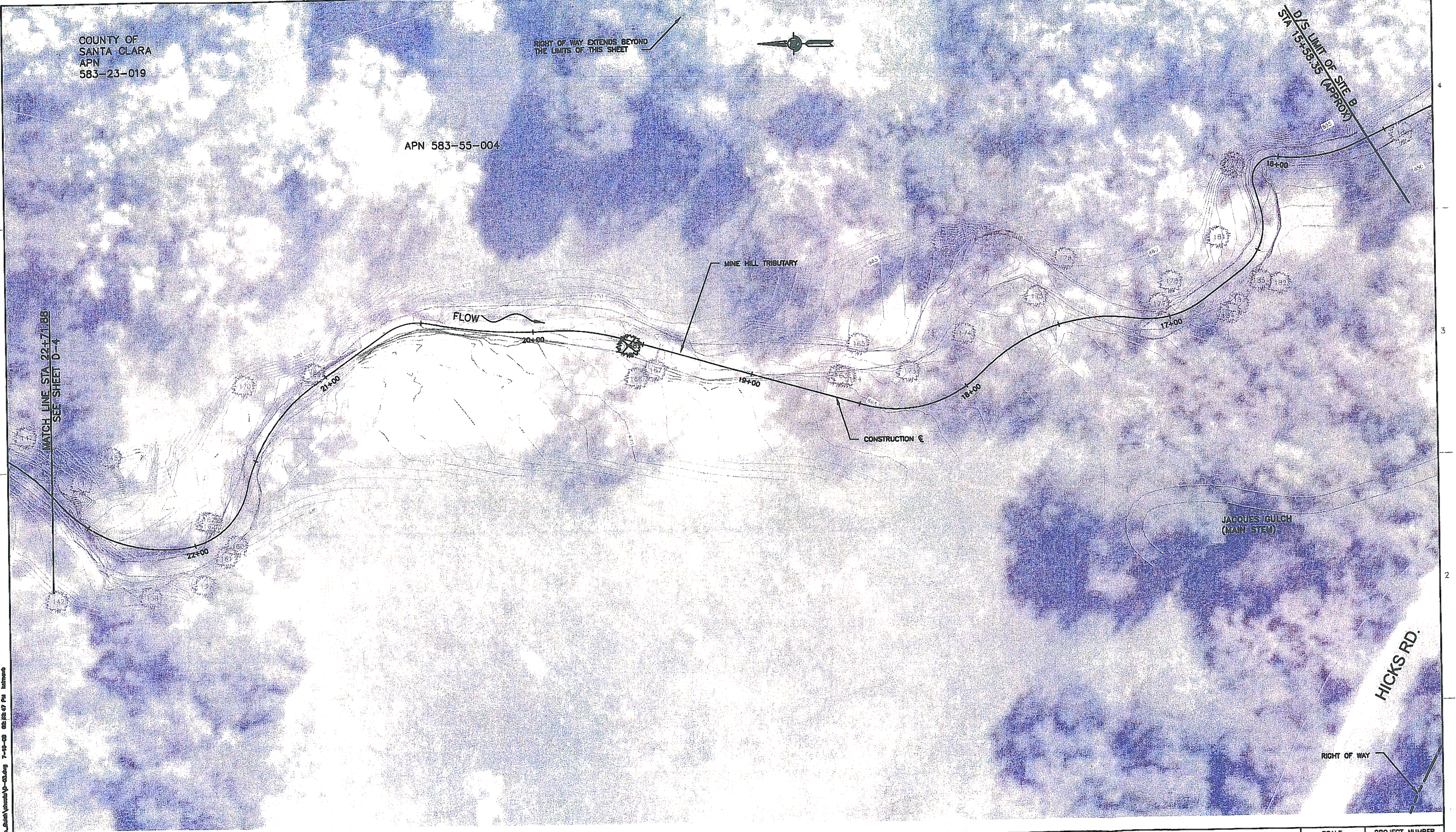
SCALE 1"=30'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002

SHEET CODE: D-2

PAGE NUMBER: 9 OF 38



REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

1. SEE SHEET D-1 FOR TREE TABLE

DATE	07-10-08
DESIGN	K.N.
DRAWN	L.P.
CHECKED	D.M.

ENGINEERING CERTIFICATION

MICHAEL STUART THOMAS
Exp. 06/30/09
CIVIL

PROJECT ENGINEER 07/10/08 DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

PROJECT ENGINEER 07/10/08 MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT

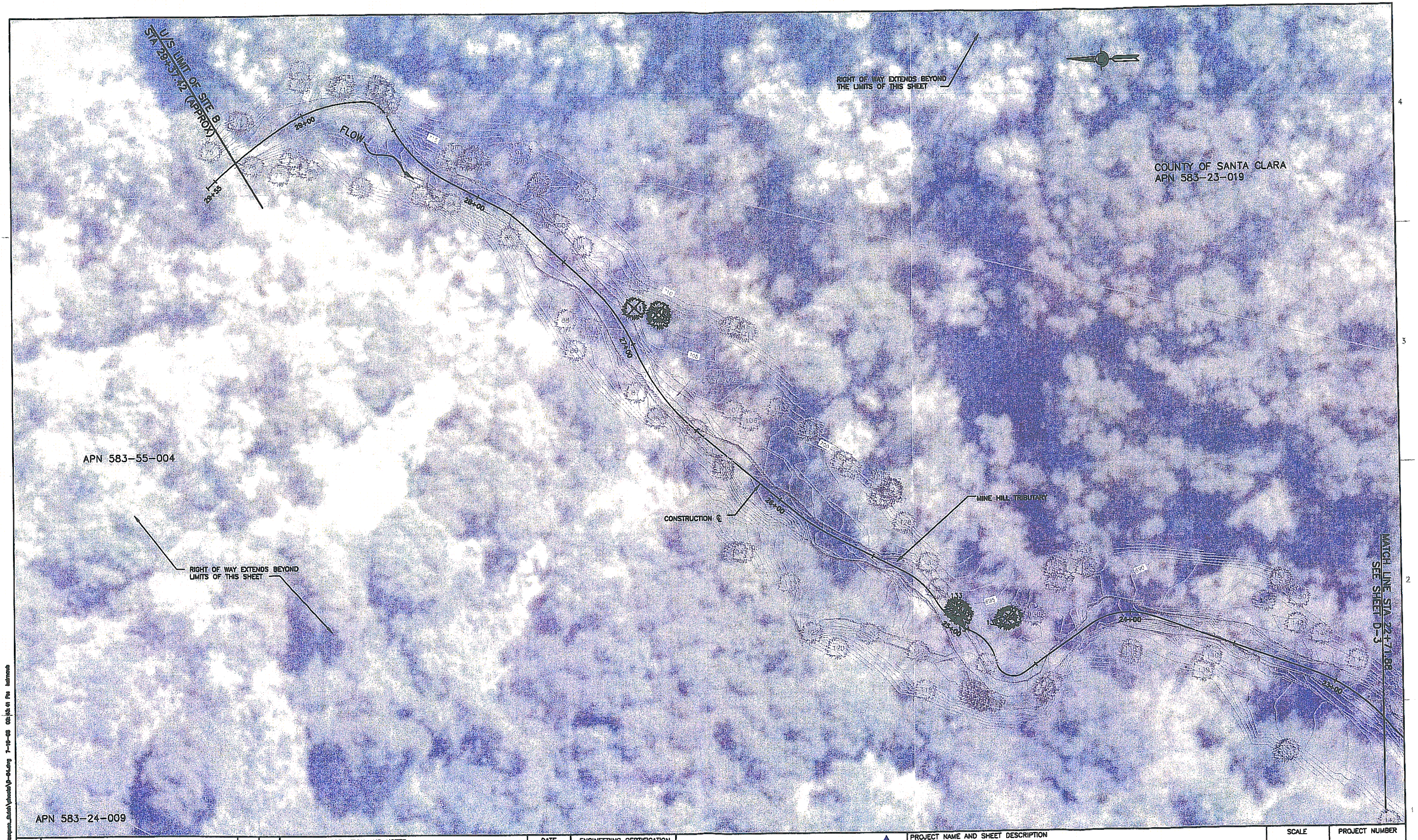
SITE B TREE REMOVAL PLAN

SCALE
1" = 20'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002

SHEET CODE:
D-3



REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

1. SEE SHEET D-1 FOR TREE TABLE

DATE 07-10-08
DESIGN K.N.
DRAWN L.P.
CHECKED D.M.

ENGINEERING CERTIFICATION
CIVIL
PROJECT ENGINEER 07/10/08 DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
PROJECT ENGINEER 07/10/08 MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT

SITE B TREE REMOVAL PLAN

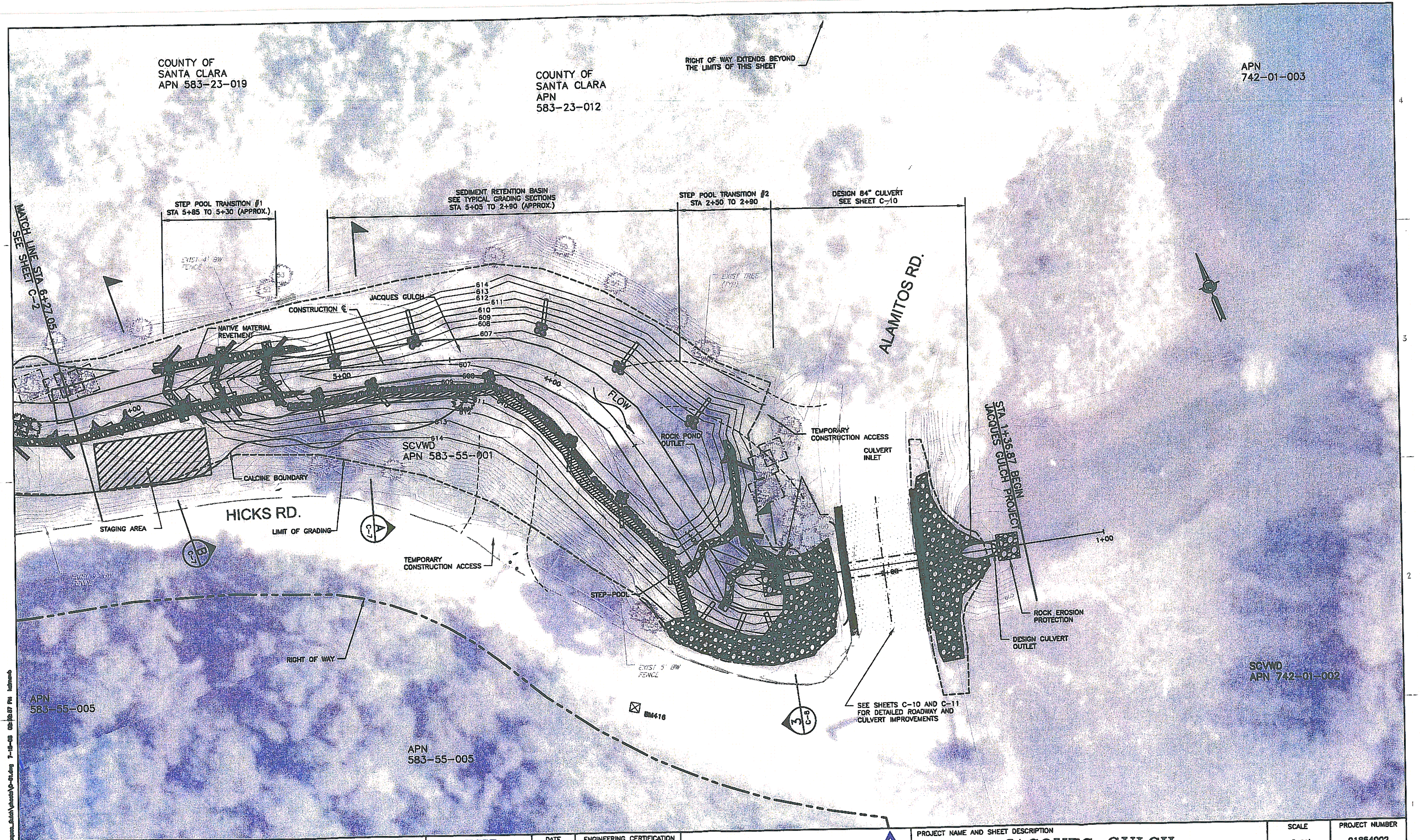
SCALE 1" = 20'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002

SHEET CODE: D-4

PAGE NUMBER: 11 OF 38



REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

CLEARWATER HYDROLOGY
2974 Adeline Street
Berkeley, California
PH: (510) 841-1836

DATE	07-10-08
DESIGN	WV/NM
DRAWN	NM
CHECKED	WV

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
CIVIL
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT

SITE A RESTORATION PLAN

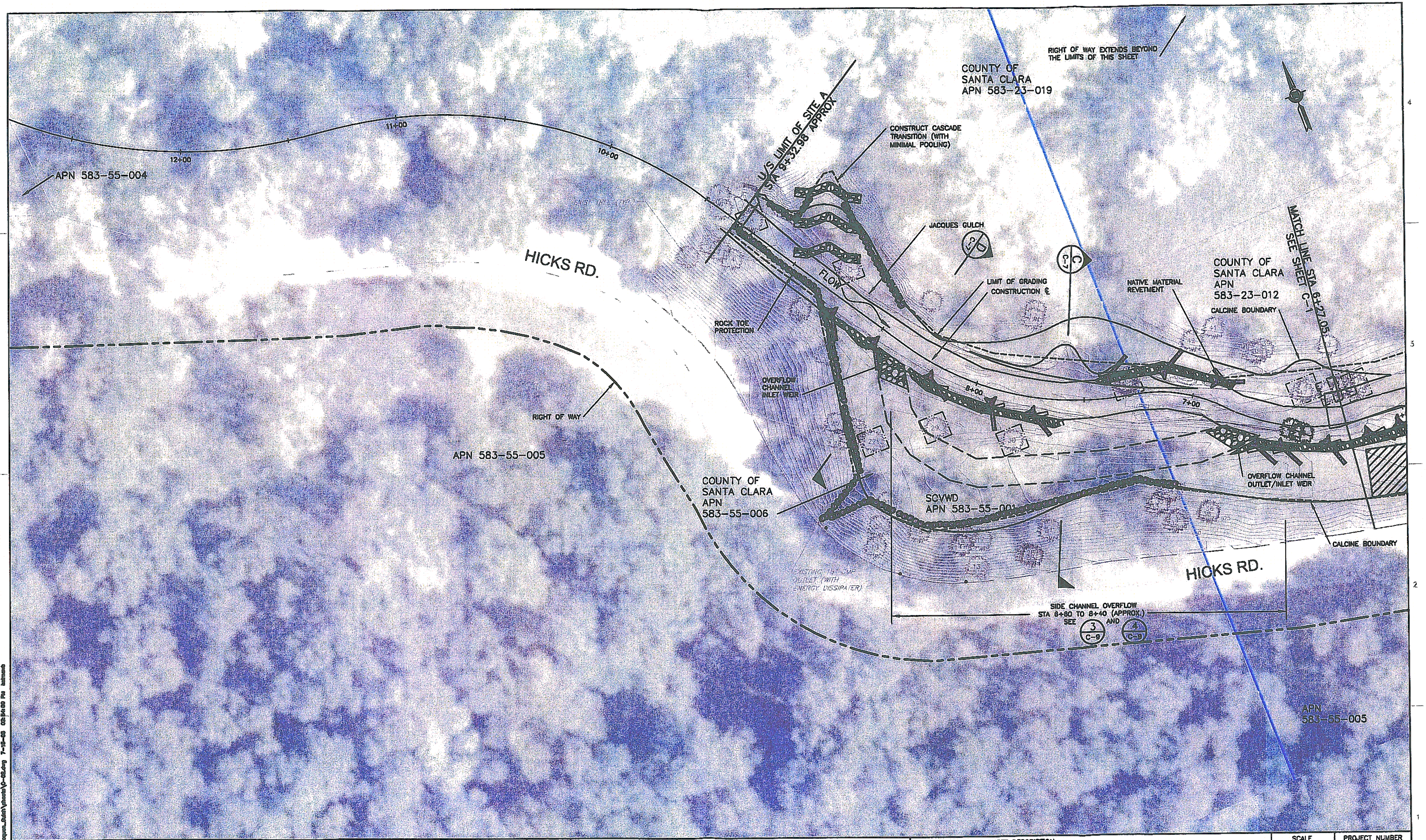
SCALE
1"=20'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002

SHEET CODE:
C-1

PAGE NUMBER:
12 OF 38


RIGHT OF WAY EXTENDS BEYOND THE LIMITS OF THIS SHEET
COUNTY OF SANTA CLARA APN 583-23-019
APN 583-55-004
12+00
11+00
10+00
U/S LIMIT OF SITE A STA 9+32.98 APPROX
CONSTRUCT CASCADE TRANSITION (WITH MINIMAL POOLING)
JACQUES GULCH
D C-7
C C-7
HICKS RD.
FLOW
LIMIT OF GRADING
CONSTRUCTION ℄
NATIVE MATERIAL REVETMENT
COUNTY OF SANTA CLARA APN 583-23-012
CALCINE BOUNDARY
MATCH LINE STA 6+27.05 SEE SHEET C-1
ROCK TOE PROTECTION
OVERFLOW CHANNEL INLET WEIR
8+00
7+00
RIGHT OF WAY
APN 583-55-005
COUNTY OF SANTA CLARA APN 583-55-006
SCVWD APN 583-55-001
OVERFLOW CHANNEL OUTLET/INLET WEIR
CALCINE BOUNDARY
EXISTING 15" CMP OUTLET (WITH ENERGY DISSIPATER)
HICKS RD.
SIDE CHANNEL OVERFLOW STA 6+80 TO 8+40 (APPROX.) SEE 3 C-9 AND 4 C-9
APN 583-55-005

REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

CLEARWATER HYDROLOGY
2974 Adeline Street
Berkeley, California
PH: (510) 841-1836

DATE	07-10-08
DESIGN	WV/NM
DRAWN	NM
CHECKED	WV

ENGINEERING CERTIFICATION

MICHAEL STUART THOMAS
No. [illegible]557
Exp. 06/30/09
CIVIL

07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT

SITE A RESTORATION PLAN

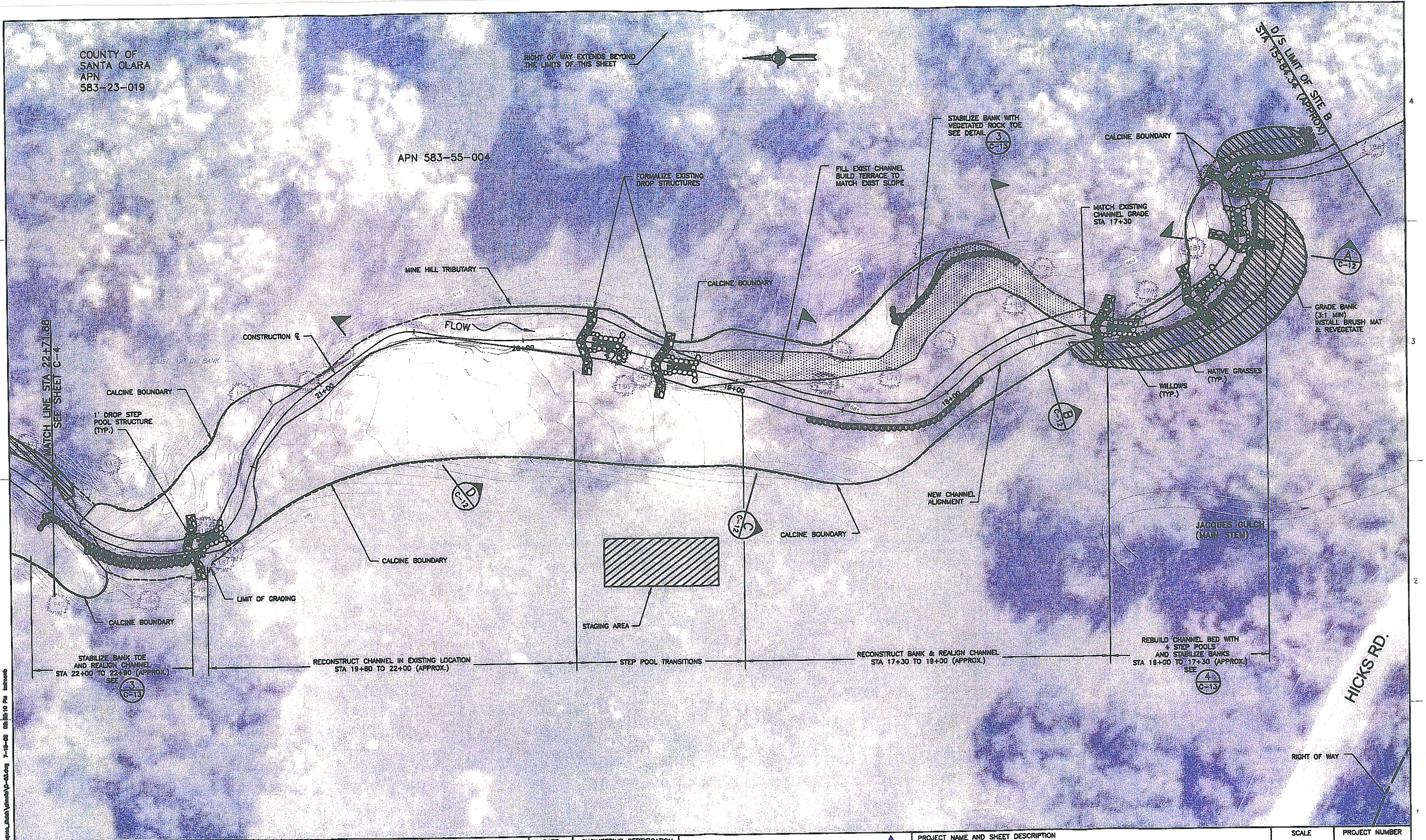
SCALE
1"=20'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002

SHEET CODE:
C-2

PAGE NUMBER:
13 OF 38


COUNTY OF SANTA CLARA APN 583-23-019
RIGHT OF WAY EXTENDS BEYOND THE LIMITS OF THIS SHEET
D/S LIMIT OF SITE B STA 15+84.34 (APPROX)
APN 583-55-004
FORMALIZE EXISTING DROP STRUCTURES
FILL EXIST CHANNEL BUILD TERRACE TO MATCH EXIST SLOPE
STABILIZE BANK WITH VEGETATED ROCK TOE SEE DETAIL 3 C-13
CALCINE BOUNDARY
MATCH EXISTING CHANNEL GRADE STA 17+30
A C-12
GRADE BANK (3:1 MIN) INSTALL BRUSH MAT & REVEGETATE
MINE HILL TRIBUTARY
CALCINE BOUNDARY
FLOW
CONSTRUCTION ℄
20+00
21+00
19+00
18+00
NATIVE GRASSES (TYP.)
WILLOWS (TYP.)
B C-12
MATCH LINE STA 22+71.88 SEE SHEET C-4
CALCINE BOUNDARY
1' DROP STEP POOL STRUCTURE (TYP.)
D C-12
C C-12
NEW CHANNEL ALIGNMENT
CALCINE BOUNDARY
CALCINE BOUNDARY
JACQUES GULCH (MAIN STEM)
LIMIT OF GRADING
STAGING AREA
CALCINE BOUNDARY
STABILIZE BANK TOE AND REALIGN CHANNEL STA 22+00 TO 22+80 (APPROX.) SEE 3 C-13
RECONSTRUCT CHANNEL IN EXISTING LOCATION STA 19+80 TO 22+00 (APPROX.)
STEP POOL TRANSITIONS
RECONSTRUCT BANK & REALIGN CHANNEL STA 17+30 TO 19+00 (APPROX.)
REBUILD CHANNEL BED WITH 4 STEP POOLS AND STABILIZE BANKS STA 16+00 TO 17+30 (APPROX.) SEE 4 C-13
HICKS RD.
RIGHT OF WAY

REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

1. REFER TO SHEETS C-14 AND C-15 FOR TEMPORARY CONSTRUCTION ACCESS.

PWA
PHILIP WILLIAMS & ASSOCIATES, LTD.
720 CALIFORNIA STREET, SUITE 600
SAN FRANCISCO, CALIFORNIA 94108-2404
PHONE (415) 262-2300 FAX (415) 262-2303

DATE 07-10-08
DESIGN A. COLLISON
DRAWN
DATE
CHECKED A. COLLISON

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 09/30/08
CIVIL
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT

SITE B RESTORATION PLAN

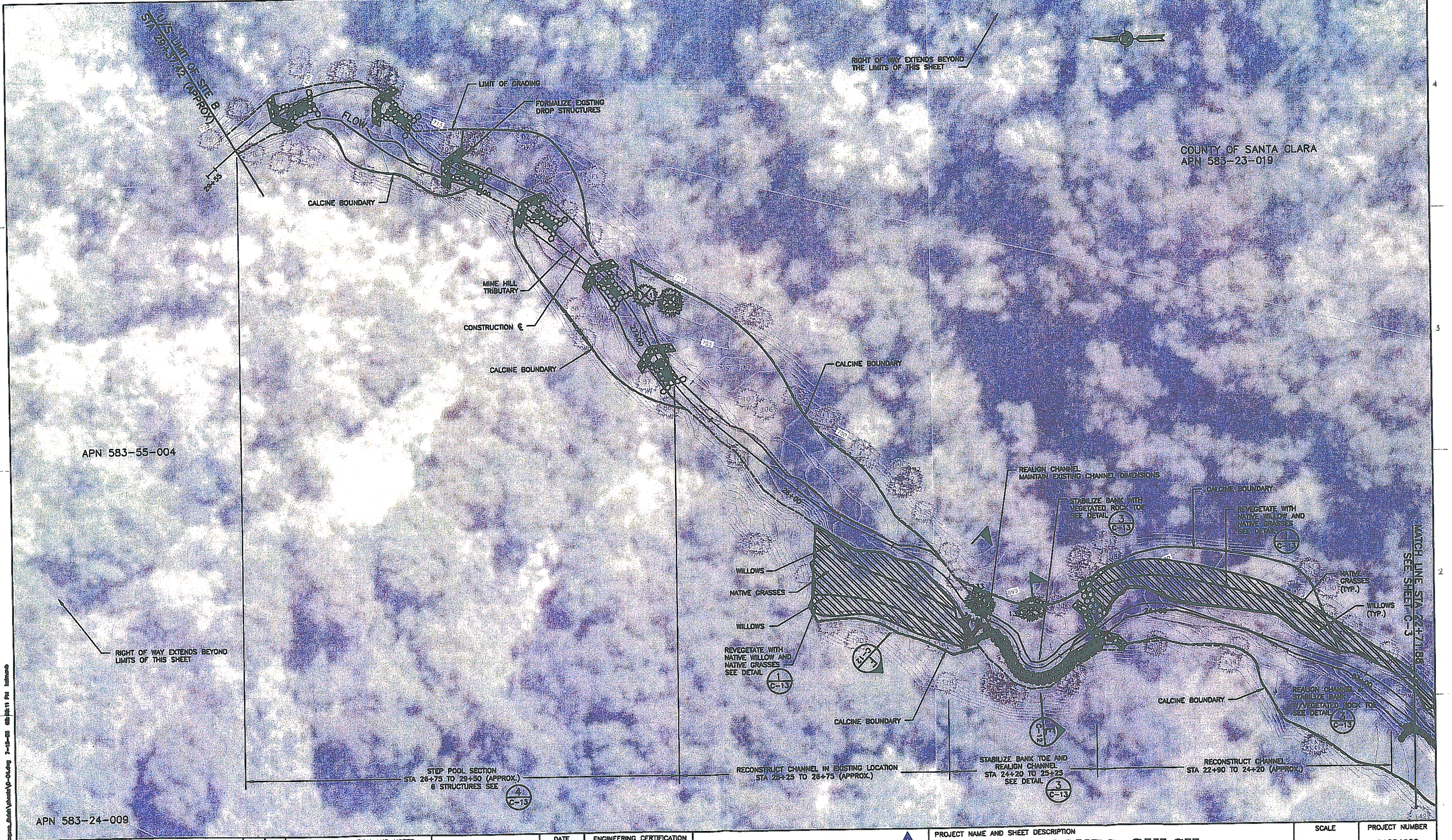
SCALE 1" = 20'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002

SHEET CODE: C-3

PAGE NUMBER: 14 OF 38


U/S LIMIT OF SITE B
STA 29+37.42 (APPROX)
29+55
FLOW
LIMIT OF GRADING
FORMALIZE EXISTING DROP STRUCTURES
RIGHT OF WAY EXTENDS BEYOND THE LIMITS OF THIS SHEET
COUNTY OF SANTA CLARA
APN 583-23-019
CALCINE BOUNDARY
MINE HILL TRIBUTARY
CONSTRUCTION ℄
CALCINE BOUNDARY
CALCINE BOUNDARY
27+00
26+00
APN 583-55-004
REALIGN CHANNEL
MAINTAIN EXISTING CHANNEL DIMENSIONS
STABILIZE BANK WITH VEGETATED ROCK TOE SEE DETAIL 3 C-13
CALCINE BOUNDARY
REVEGETATE WITH NATIVE WILLOW AND NATIVE GRASSES SEE DETAIL 1 C-13
MATCH LINE STA 22+71.88
SEE SHEET C-3
WILLOWS
NATIVE GRASSES
WILLOWS
NATIVE GRASSES (TYP.)
WILLOWS (TYP.)
24+00
23+00
REVEGETATE WITH NATIVE WILLOW AND NATIVE GRASSES SEE DETAIL 1 C-13
C-12
E C-12
RIGHT OF WAY EXTENDS BEYOND LIMITS OF THIS SHEET
CALCINE BOUNDARY
CALCINE BOUNDARY
REALIGN CHANNEL & STABILIZE BANK W/VEGETATED ROCK TOE SEE DETAIL 3 C-13
STEP POOL SECTION
STA 26+75 TO 29+50 (APPROX.)
6 STRUCTURES SEE 4 C-13
RECONSTRUCT CHANNEL IN EXISTING LOCATION
STA 25+25 TO 26+75 (APPROX.)
STABILIZE BANK TOE AND REALIGN CHANNEL
STA 24+20 TO 25+25
SEE DETAIL 3 C-13
RECONSTRUCT CHANNEL
STA 22+90 TO 24+20 (APPROX.)
APN 583-24-009

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

PWA
PHILIP WILLIAMS & ASSOCIATES, LTD.
720 CALIFORNIA STREET, SUITE 600
SAN FRANCISCO, CALIFORNIA 94108-2404
PHONE (415) 262-2300 FAX (415) 262-2303

DATE	07-10-08
DESIGN	A. COLLISON
DRAWN	P. LUECKING
CHECKED	A. COLLISON

ENGINEERING CERTIFICATION
REGISTERED PROFESSIONAL ENGINEER
MICHAEL STUART THOMAS
No. 59057
Exp. 09/30/09
CIVIL
STATE OF CALIFORNIA
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT

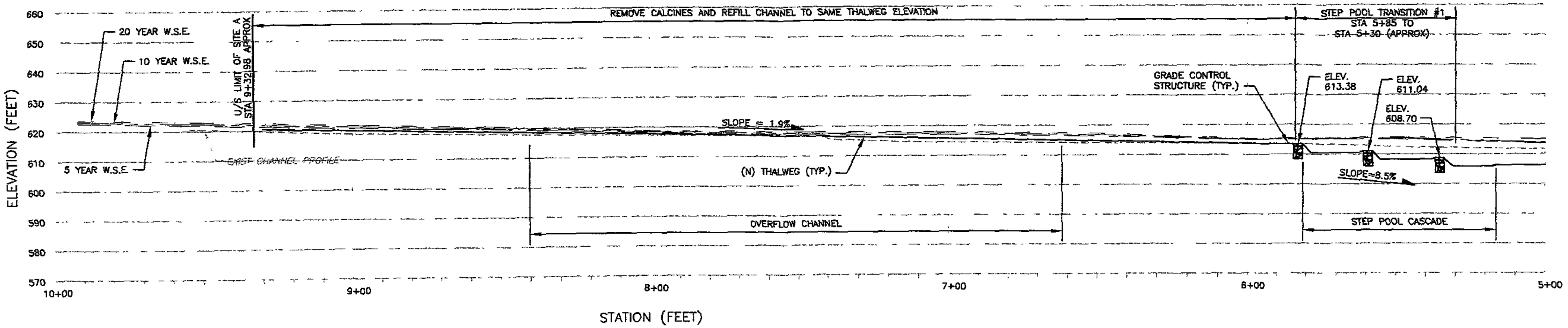
SITE B RESTORATION PLAN

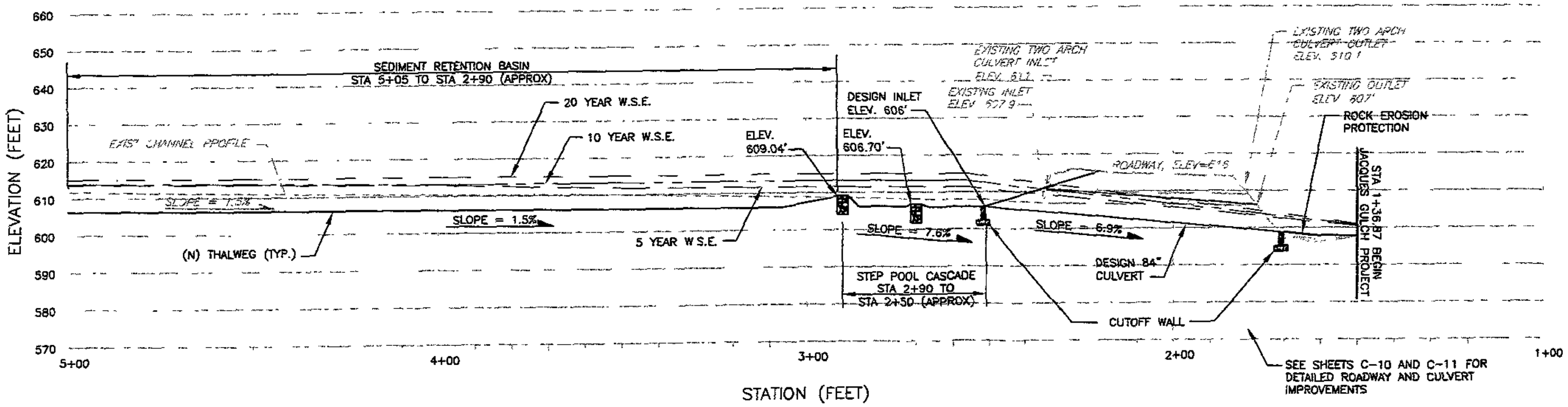
SCALE
1" = 20'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002

SHEET CODE:
C-4





SITE A

REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

CLEARWATER HYDROLOGY
2974 Adeline Street
Berkeley, California
PH: (510) 841-1836

DATE	07-10-08
DESIGN	WV/NM
DRAWN	NM
CHECKED	WV

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
No. C48557
Exp. 09/30/09
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 1 - RECOMMENDED PROJECT
SITE A LONGITUDINAL PROFILE

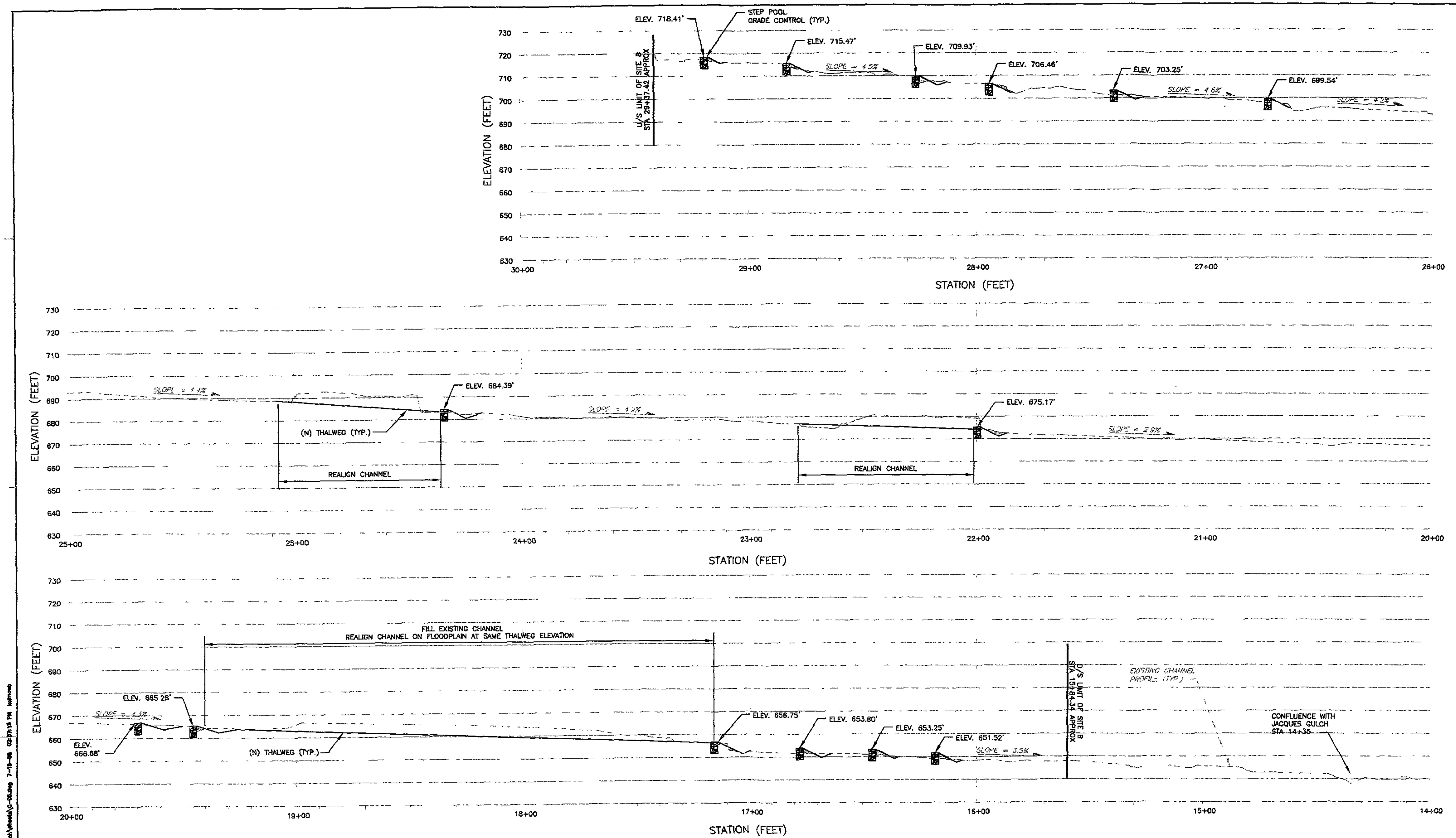
SCALE
1"=20'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002

SHEET CODE:
C-5

PAGE NUMBER:
16 OF 38



SITE B

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

PWA
PHILIP WILLIAMS & ASSOCIATES, LTD.
720 CALIFORNIA STREET, SUITE 600
SAN FRANCISCO, CALIFORNIA 94108-2404
PHONE (415) 262-2300 FAX (415) 262-2303

DATE: 07-10-08
DESIGN: A. COLLISON
DRAWN: E. WISNOSKY
CHECKED: A. COLLISON

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 09/30/09
CIVIL
PROJECT ENGINEER 07/10/08 DATE

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER 07/10/08 MM/DD/YY

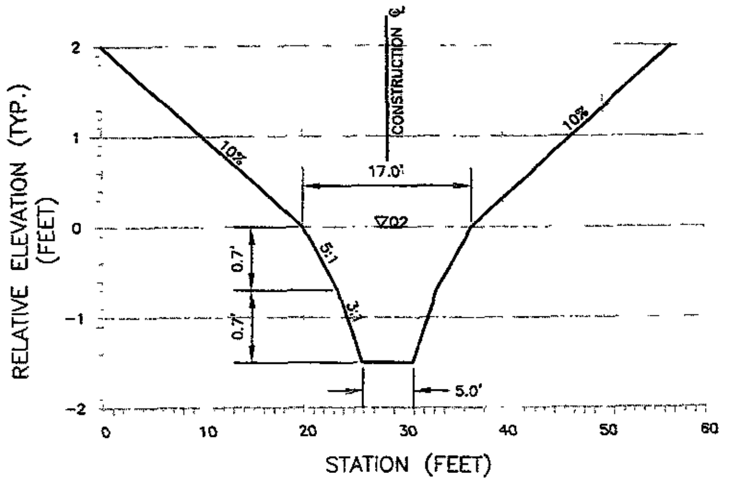
PROJECT NAME AND SHEET DESCRIPTION
JACQUES GULCH CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 1 - RECOMMENDED PROJECT
SITE B LONGITUDINAL PROFILE

SCALE: 1" = 20'
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

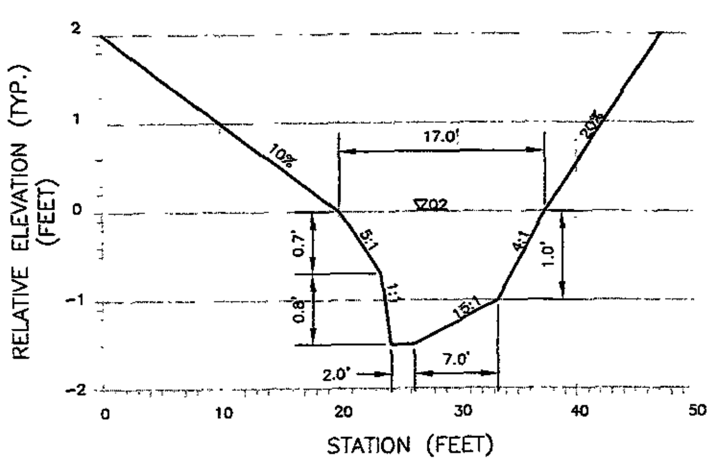
PROJECT NUMBER: 91854002
SHEET CODE: C-6
PAGE NUMBER: 17 OF 38

K:\Active Projects\HP-91854002\Jacques_Gulch\sheets\C-06.dwg 7-15-08 02:37:18 PM kalmonb

TYPICAL RESTORATION CROSS-SECTION

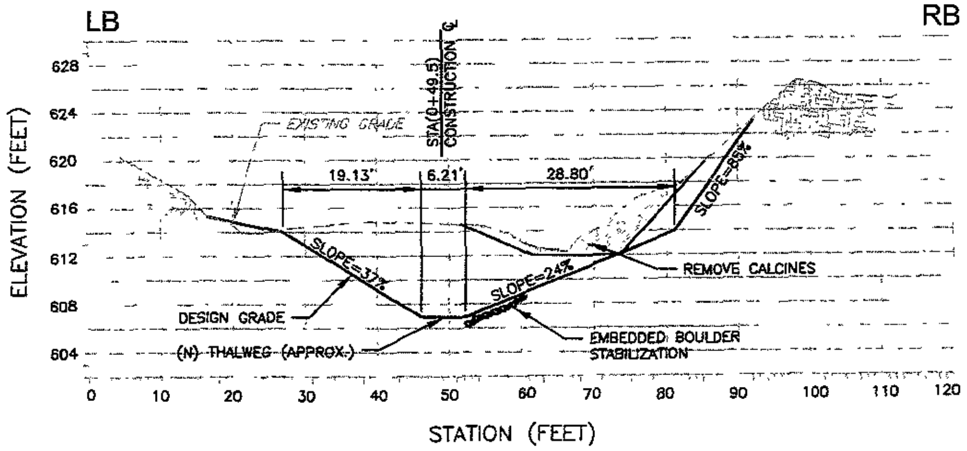


1 — RESTORATION CROSS-SECTION
STRAIGHT REACH N.T.S.

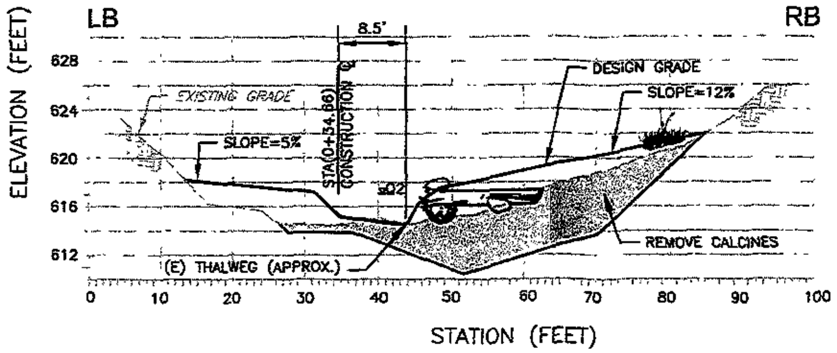


2 — RESTORATION CROSS-SECTION
MEANDER REACH N.T.S.

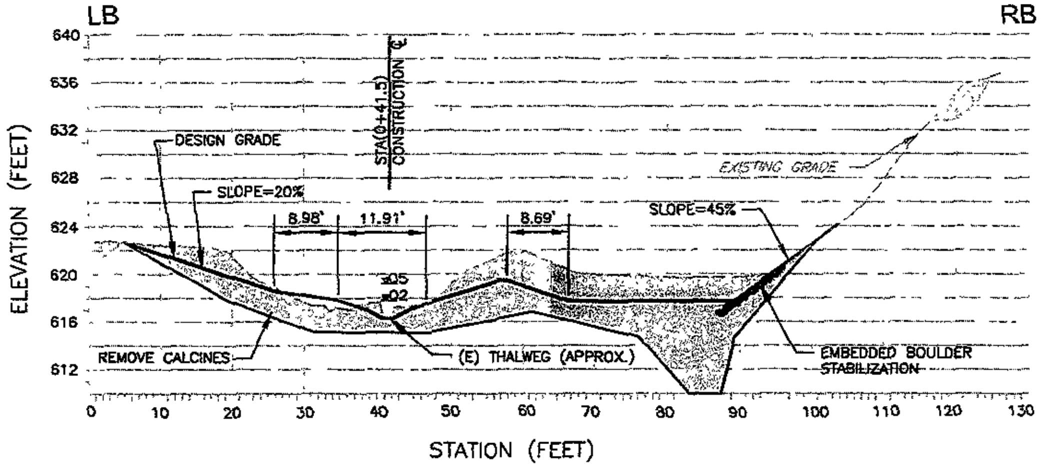
DESIGN CHANNEL CROSS-SECTIONS



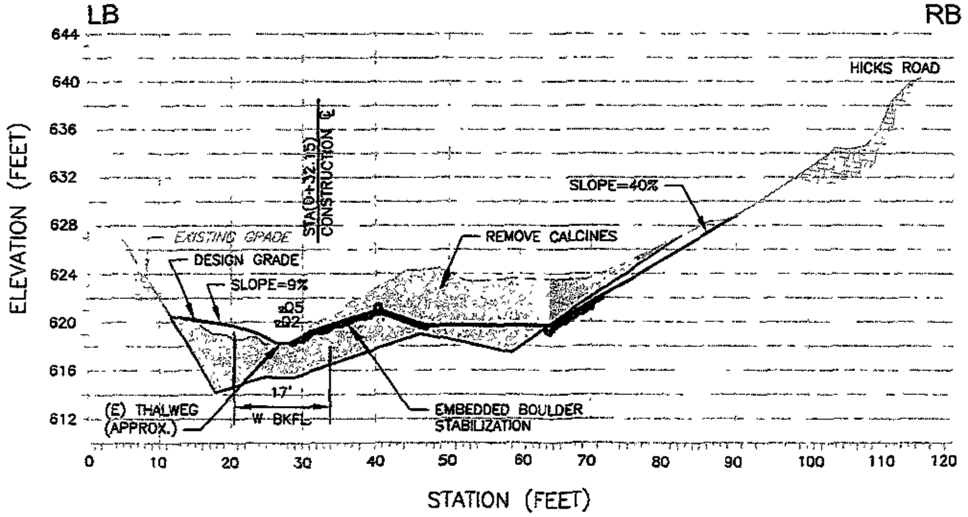
A (C-1) RESTORATION CROSS-SECTION
STA (4+90.22)



B (C-1) RESTORATION CROSS-SECTION
STA (5+92.82)



C (C-2) RESTORATION CROSS-SECTION
STA (7+58.49)



D (C-2) RESTORATION CROSS-SECTION
STA (8+36.14)

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			1. X-SECTIONS LOOKING DOWNSTREAM

CLEARWATER HYDROLOGY
2974 Adeline Street
Berkeley, California
PH: (510) 841-1836

DATE	07-10-08
DESIGN	WV/NM
DRAWN	NM
CHECKED	WV

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
C56957
Exp. 09/30/09
PROJECT ENGINEER 07/10/08 DATE

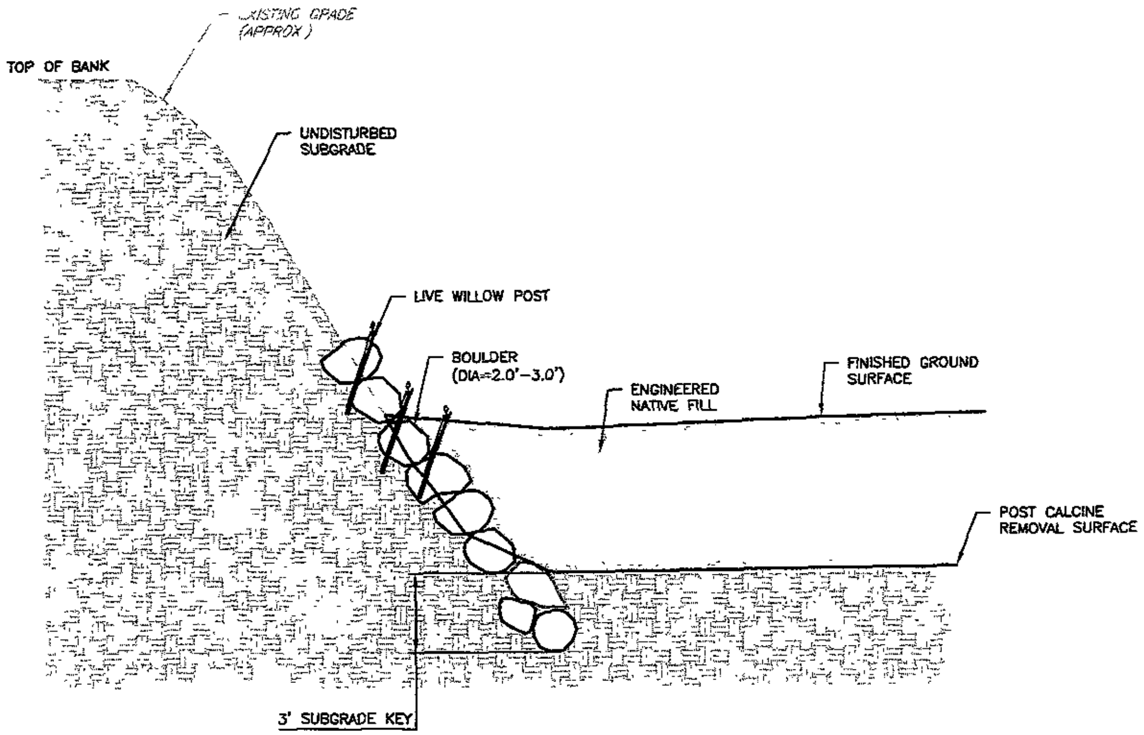
Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER 07/10/08 MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION
JACQUES GULCH
CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 1 - RECOMMENDED PROJECT
SITE A CHANNEL CROSS SECTIONS

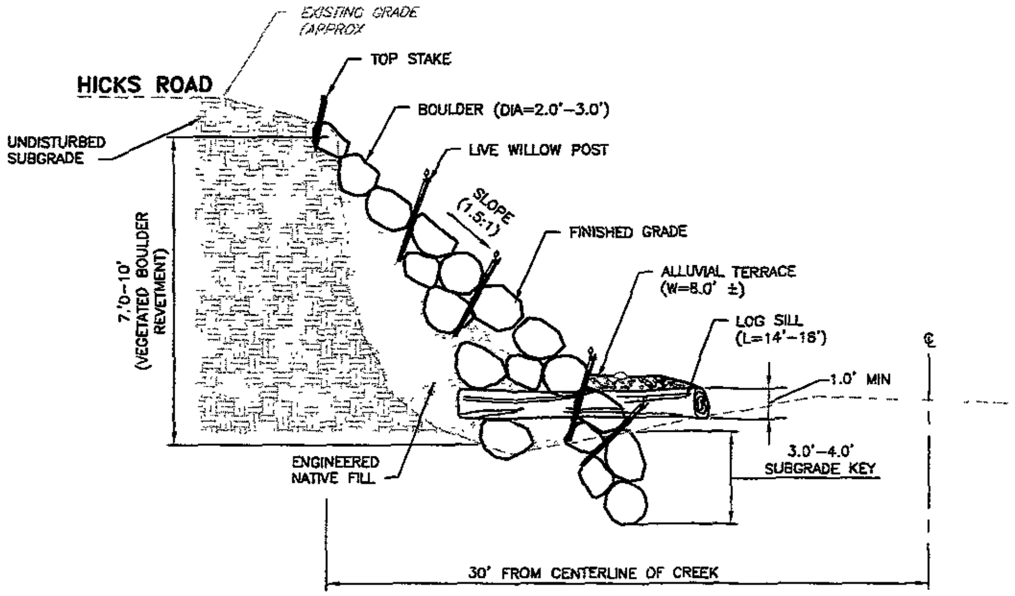
SCALE
Not to Scale
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002
SHEET CODE:
C-7
PAGE NUMBER:
18 OF 38

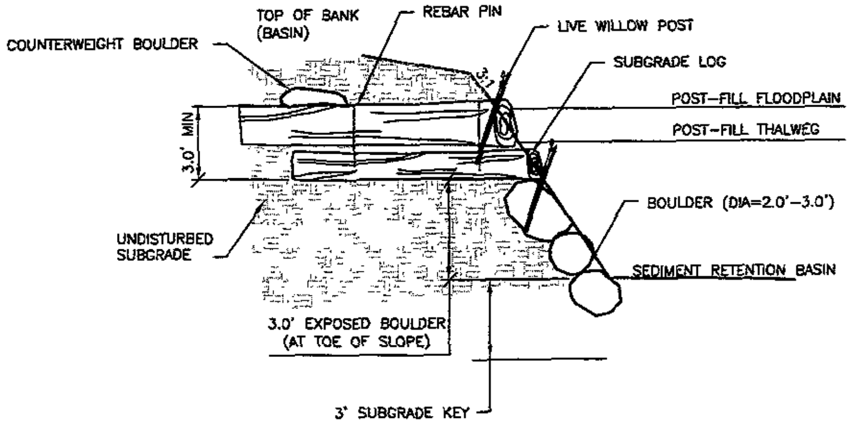
BIOTECHNICAL STABILIZATION DETAILS



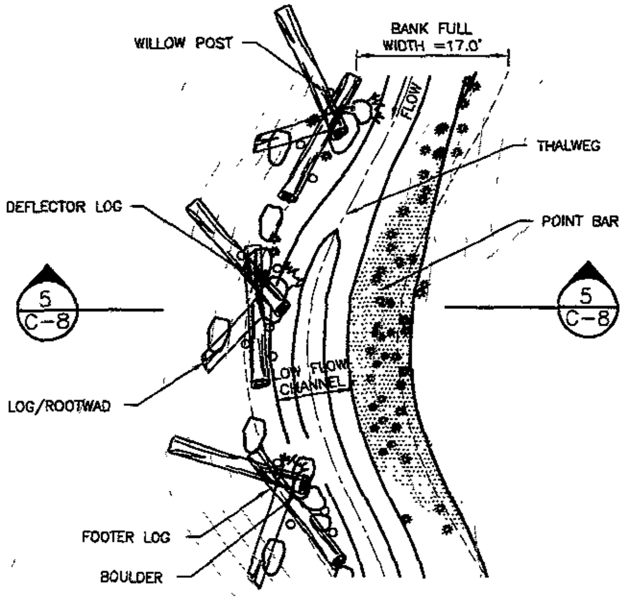
1 — ROCK TOE PROTECTION
STA (7+00) TO (9+40) N.T.S.



3 C–1 VEGETATED BOULDER REVETMENT
STA (2+35) TO (3+00) N.T.S.

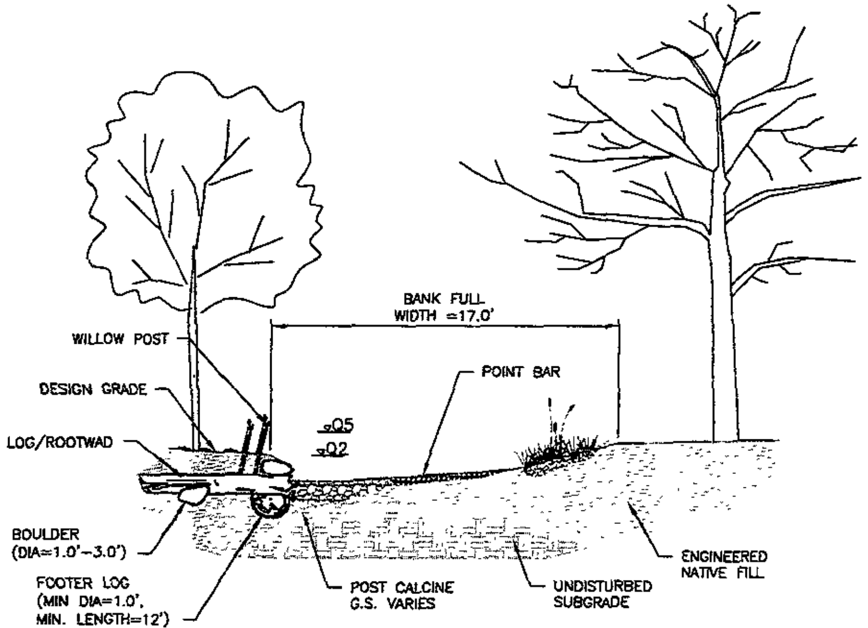


2 — RETENTION BASIN STABILIZATION
STA (3+00) TO (5+20) N.T.S.



NOTE: ROOTWAD ASSEMBLIES SHALL BE INSTALLED APPROXIMATELY 8.0' O.C..

4 — NATIVE MATERIAL REVETMENT
PLAN VIEW N.T.S.



NOTE:
REVETMENT HEIGHT TO Q5 LEVEL FROM STA. 6+40 TO STA. 8+37

5 C–8 NATIVE MATERIAL REVETMENT
CROSS-SECTION VIEW N.T.S.

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			1. ALL DETAILS LOOKING UPSTREAM

CLEARWATER HYDROLOGY
2974 Adeline Street
Berkeley, California
PH: (510) 841-1836

DATE 07-10-08
DESIGN WV/NM
DRAWN NM
CHECKED WV

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
No. 56557
Exp. 09/30/09
PROJECT ENGINEER 07/10/08 DATE

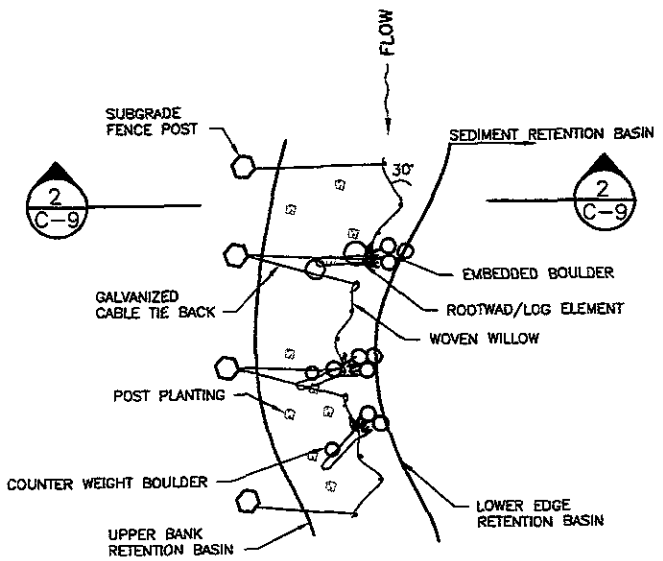
Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER 07/10/08 MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION
JACQUES GULCH
CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 1 – RECOMMENDED PROJECT
SITE A CONSTRUCTION DETAILS

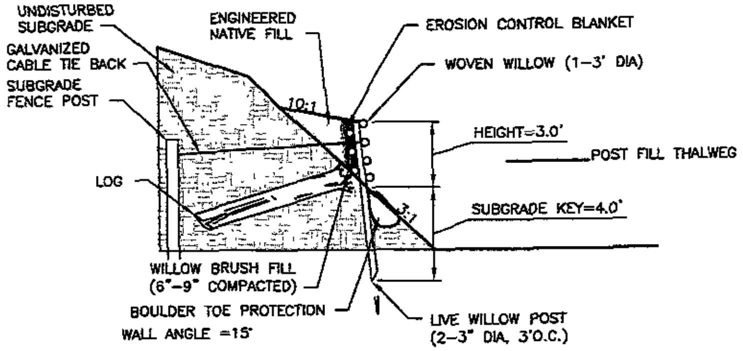
SCALE: Not to Scale
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 91854002
SHEET CODE: C-8
PAGE NUMBER: 19 OF 38

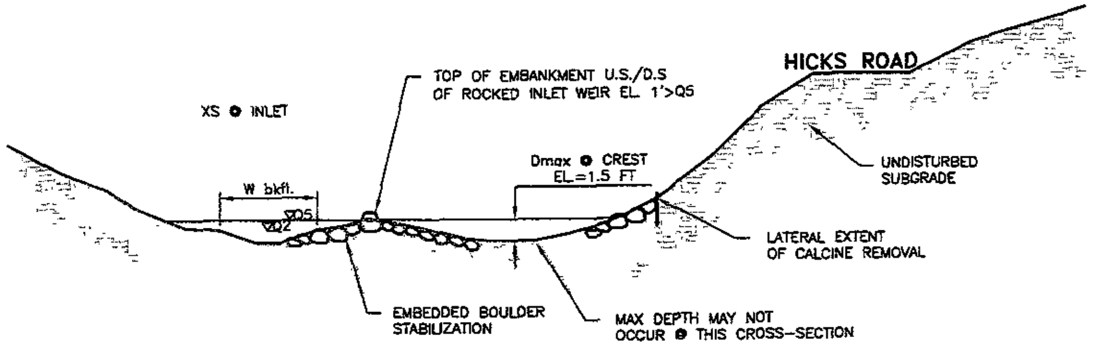
BIOTECHNICAL STABILIZATION DETAILS



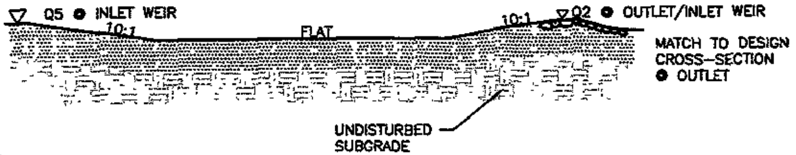
1 / — WILLOW WALL REVETMENT
PLAN VIEW STA (3+00) TO STA (5+10) N.T.S.



2 / C-9 WILLOW WALL REVETMENT
SECTION VIEW N.T.S.

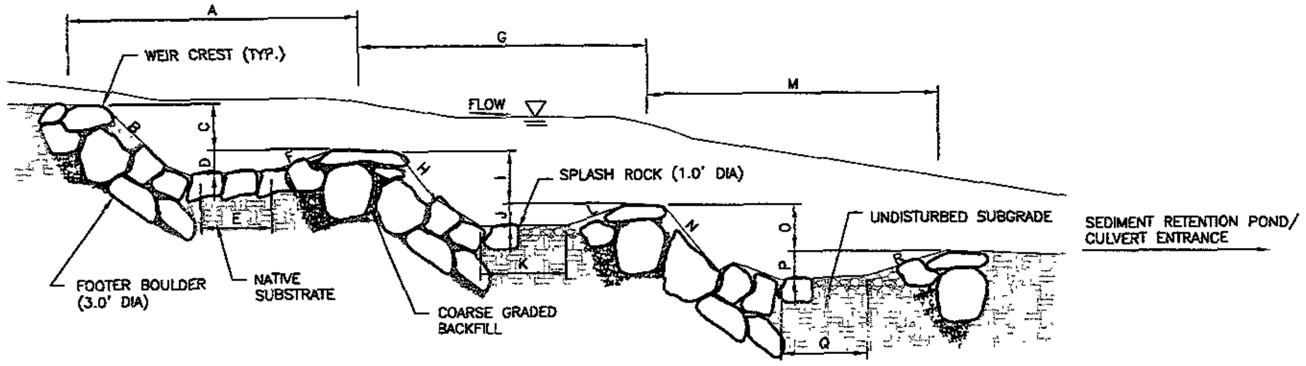

XS @ INLET
TOP OF EMBANKMENT U.S./D.S OF ROCKED INLET WEIR EL 1'>Q5
HICKS ROAD
W bkfl.
Q5
Q2
Dmax @ CREST EL.=1.5 FT
UNDISTURBED SUBGRADE
LATERAL EXTENT OF CALCINE REMOVAL
EMBEDDED BOULDER STABILIZATION
MAX DEPTH MAY NOT OCCUR @ THIS CROSS-SECTION BUT FURTHER D.S.

3 / C-2 SIDE CHANNEL OVER FLOW
CROSS-SECTION VIEW N.T.S.
LOOKING DOWNSTREAM



4 / C-2 SIDE CHANNEL OVER FLOW
LONGITUDINAL PROFILE N.T.S.
LOOKING DOWNSTREAM

STEP-POOL TRANSITION STABILIZATION DETAILS

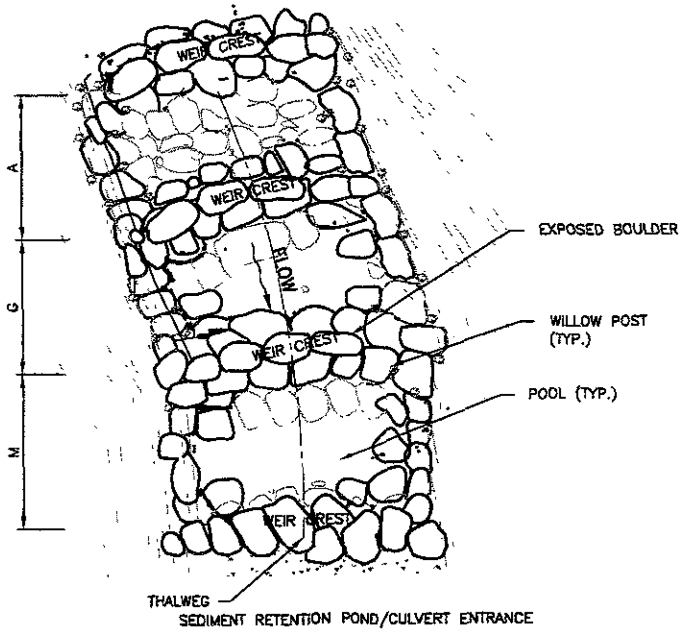


NOTE: WILLOW POST PLANTING WILL BE INSTALLED AROUND WEIRS/POOLS

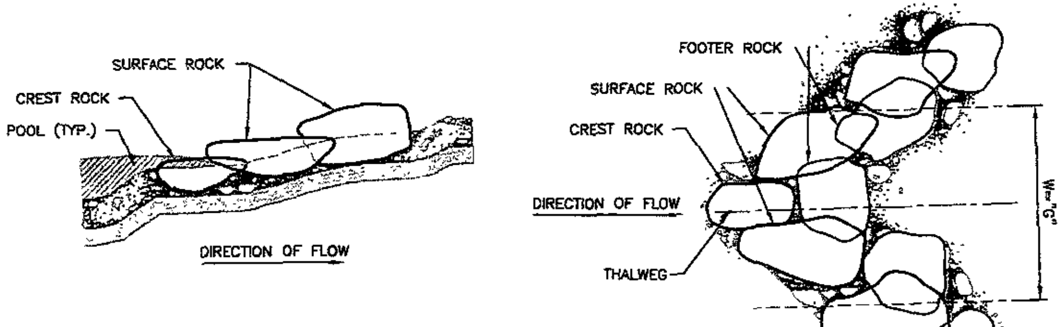
5 / — STEP POOL TRANSITION
LONGITUDINAL PROFILE N.T.S.

TABLE 1: CHARACTERISTIC VALUES FOR STEP POOL FEATURE

DETAIL VARIABLE	STEP–POOL TRANSITION #1	STEP–POOL TRANSITION #2
A	20.0'	20.3'
B	1:1	1:1
C	2.2'	2.3'
D	0.5'	0.5'
E	13.0'	13.0'
F	3:1	3:1
G	20.0'	18.5'
H	1:1	1:1
I	2.2'	1.6'
J	0.5'	NA
K	13.0'	16.9'
L	3:1	3:1
M	20.0'	NA
N	1:1	NA
O	2.2'	NA
P	0.5'	NA
Q	13.0'	NA
R	3:1	NA



6 / — STEP POOL TRANSITION
PLAN VIEW N.T.S.



ELEVATION
GENERAL NOTES:
1. FOOTER BOULDERS NOT SHOWN
2. SURFACE BOULDER SIZE INCREASES WITH DISTANCE FROM THALWEG.

PLAN
GENERAL NOTES:
1. BOULDER SIZES RANGE
2. SURFACE BOULDER SIZE INCREASES WITH DISTANCE FROM THALWEG.

7 / — WEIR DETAIL
ELEVATION AND PLAN VIEW N.T.S.

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
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CLEARWATER HYDROLOGY
2974 Adeline Street
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DATE	07-10-08
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DRAWN	NM
CHECKED	WV

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 09/30/09
CIVIL
PROJECT ENGINEER 07/10/08 DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
PROJECT ENGINEER 07/10/08 MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 1 – RECOMMENDED PROJECT
SITE A CONSTRUCTION DETAILS

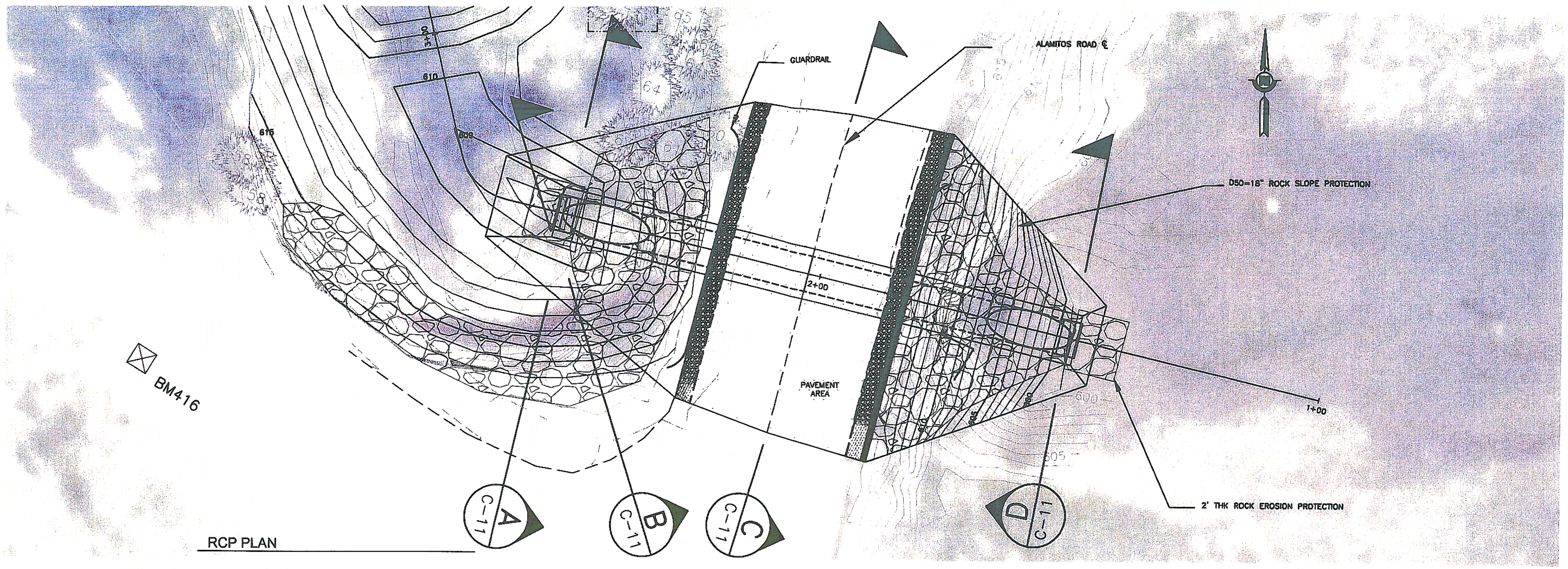
SCALE
Not to Scale

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

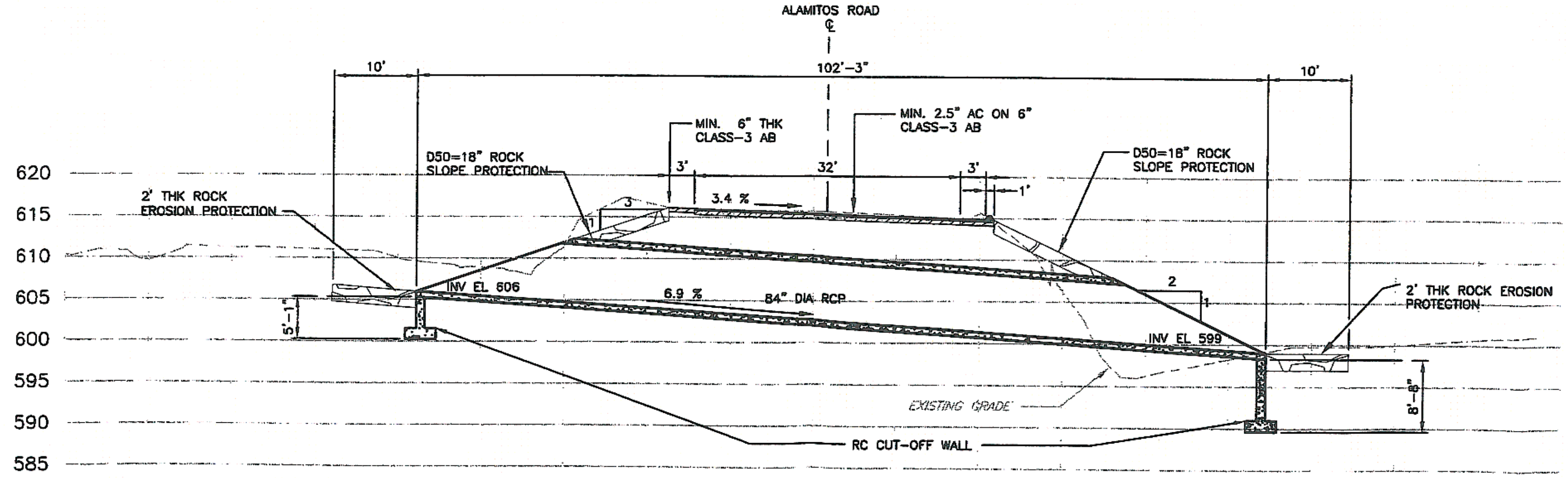
PROJECT NUMBER
91854002

SHEET CODE:
C-9

PAGE NUMBER:
20 OF 38



RCP PLAN



RCP PROFILE

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

LEE Incorporated
ENGINEERS • SCIENTISTS • CONTRACTORS

DATE 07-10-08
DESIGN M.T.
DRAWN A.K.
CHECKED E.L.

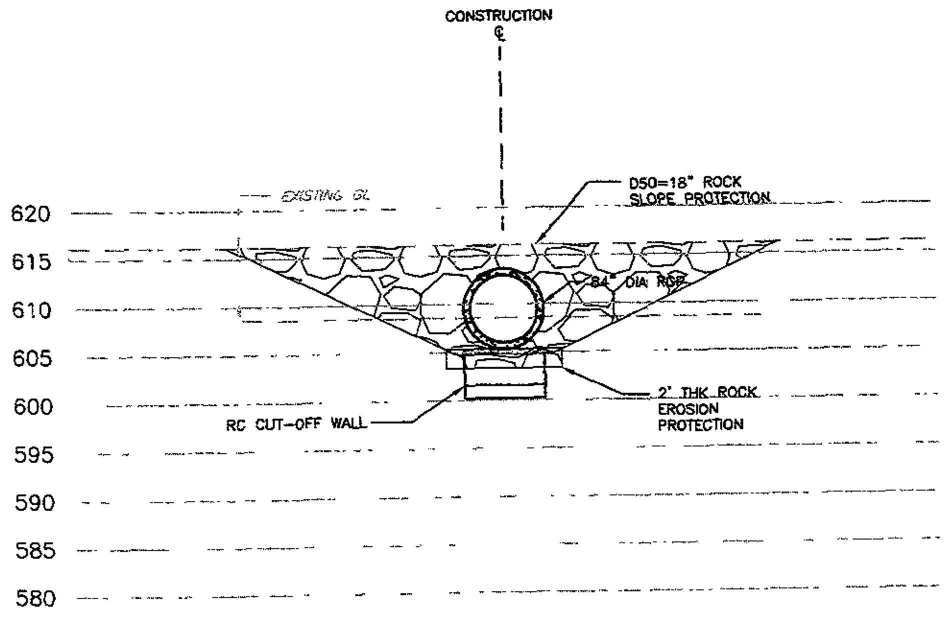
ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 09/30/09
CIVIL
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER 07/10/08 MM/DD/YY

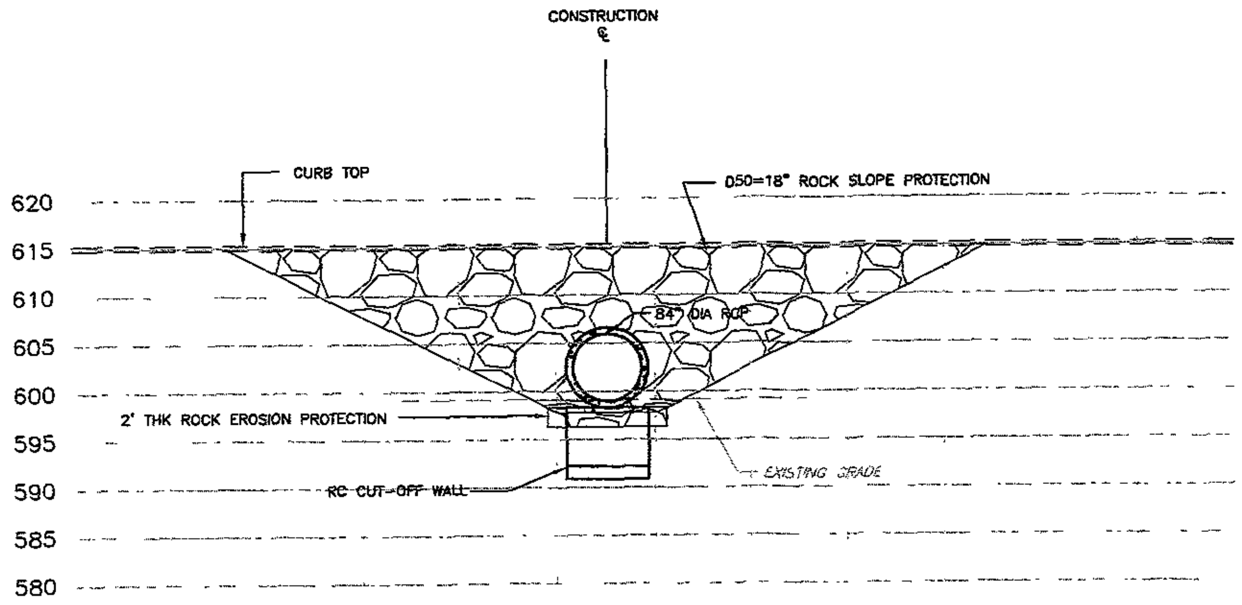
PROJECT NAME AND SHEET DESCRIPTION
JACQUES GULCH
CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 1 - RECOMMENDED PROJECT
SITE A CULVERT PLAN & PROFILE

SCALE 1"=10'
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

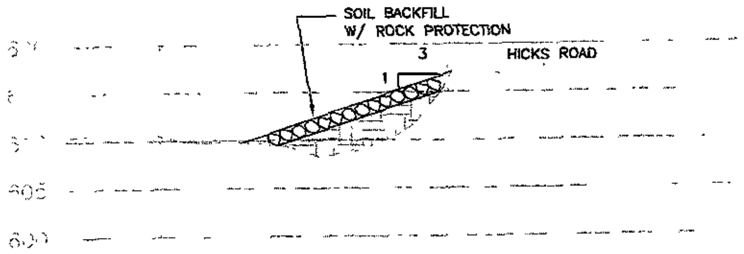
PROJECT NUMBER 91845002
SHEET CODE: C-10
PAGE NUMBER: 21 OF 38



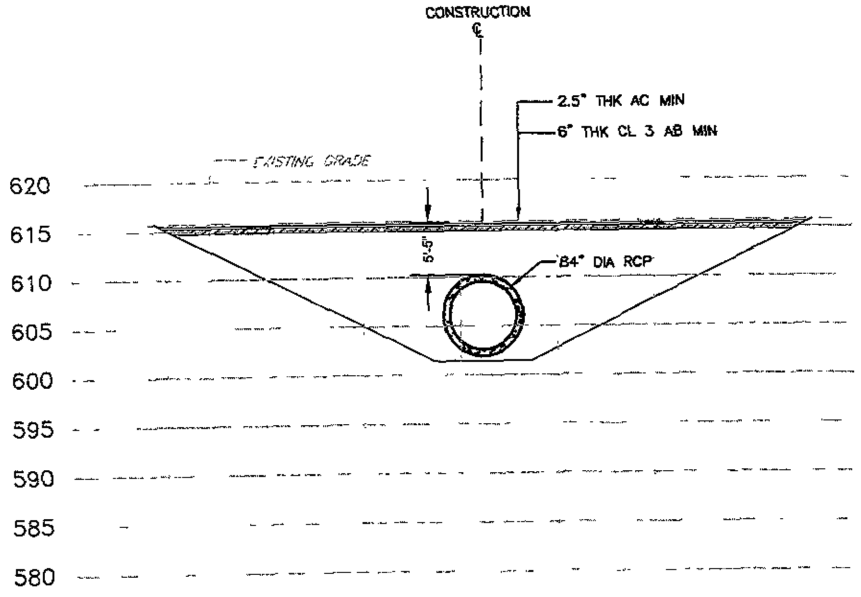
A SECTION (AT UPSTREAM) N.T.S.



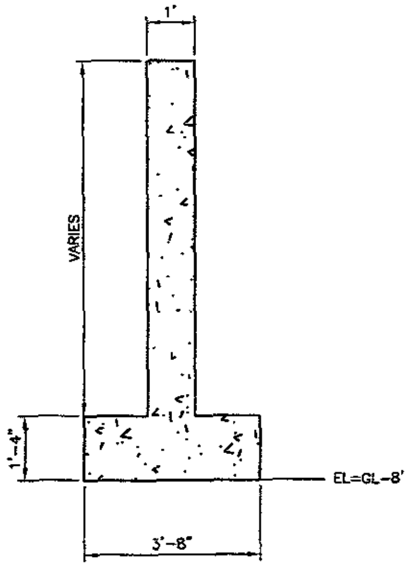
D SECTION (AT DOWNSTREAM) N.T.S.



B C-10 SECTION N.T.S.



C SECTION (AT ROAD CENTER) N.T.S.



ELEVATION (CUT-OFF WALL) N.T.S.

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

LEE Incorporated
ENGINEERS • SCIENTISTS • CONTRACTORS

DATE 07-10-08
DESIGN M.T.
DRAWN A.K.
CHECKED E.L.

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 09/30/09
PROJECT ENGINEER 07/10/08 DATE

Santa Clara Valley Water District

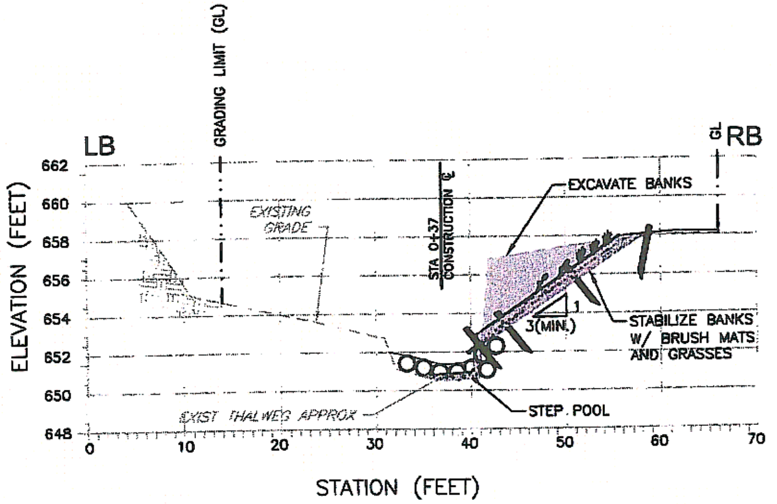
ACCEPTED BY DISTRICT
PROJECT ENGINEER 07/10/08 MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

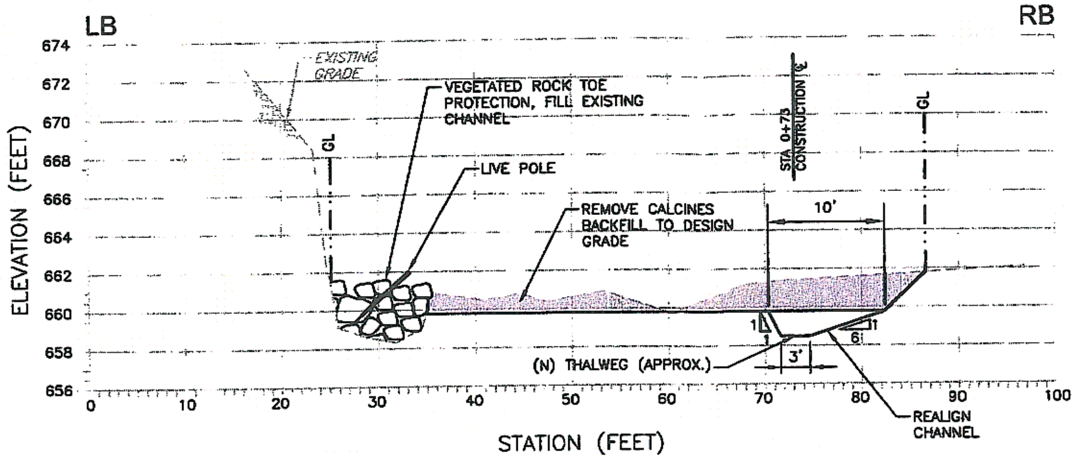
JACQUES GULCH
CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 1 - RECOMMENDED PROJECT
SITE A CULVERT SECTIONS

SCALE: NOT TO SCALE
VERIFY SCALES 0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

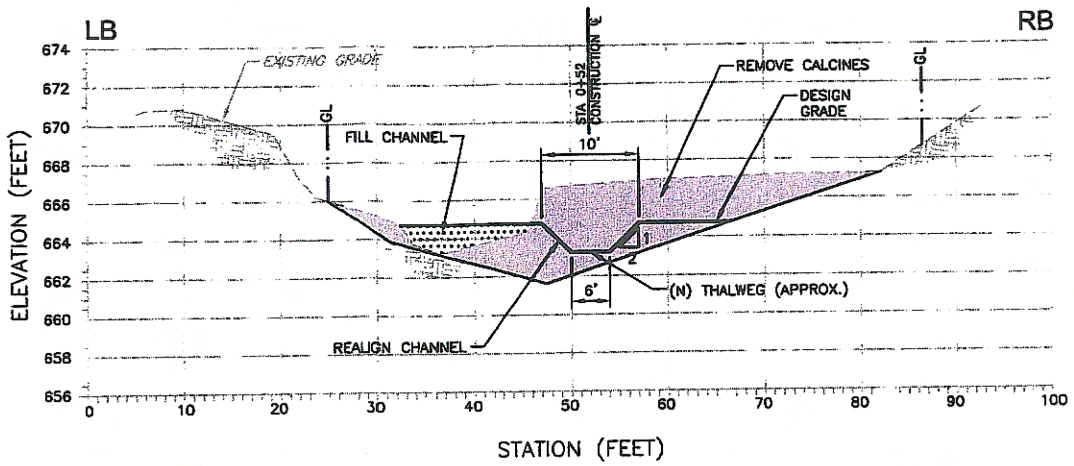
PROJECT NUMBER 91854002
SHEET CODE: C-11
PAGE NUMBER: 22 OF 38



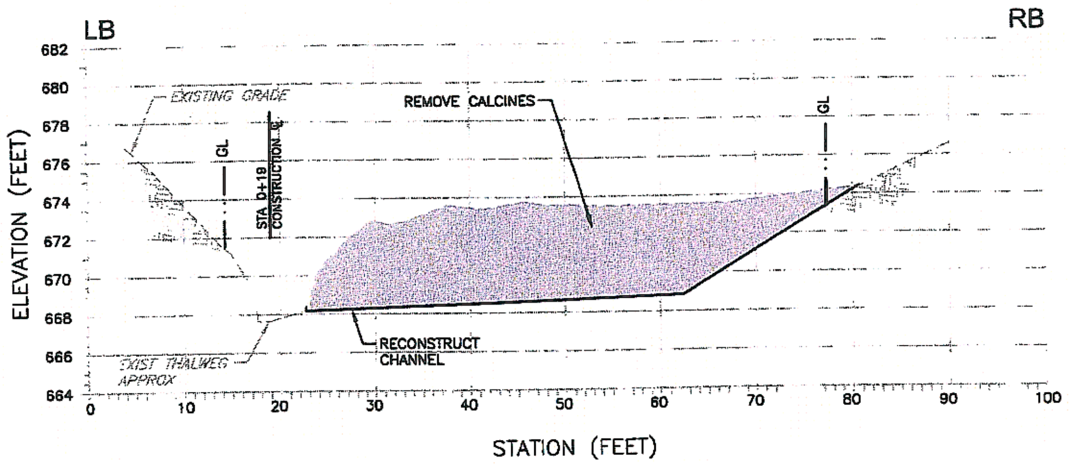
A C-3 RESTORATION CROSS-SECTION
STA 16+42.85 N.T.S.



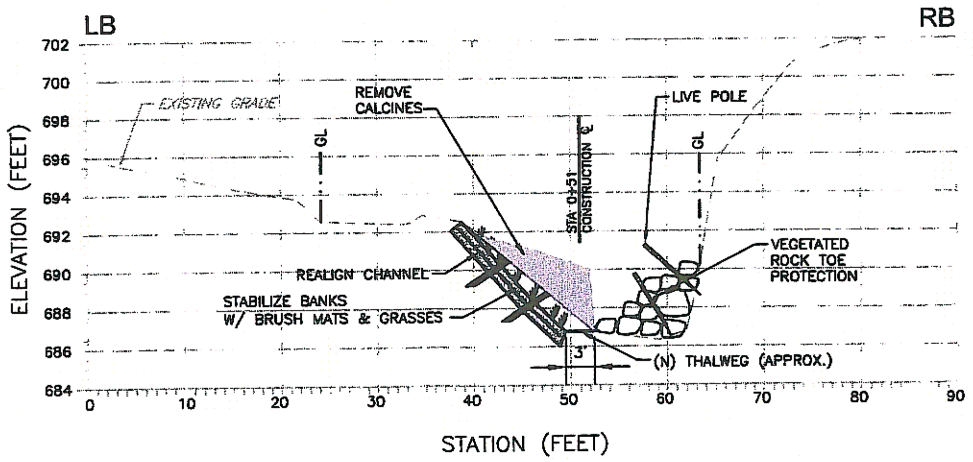
B C-3 RESTORATION CROSS-SECTION
STA 17+50.03 N.T.S.



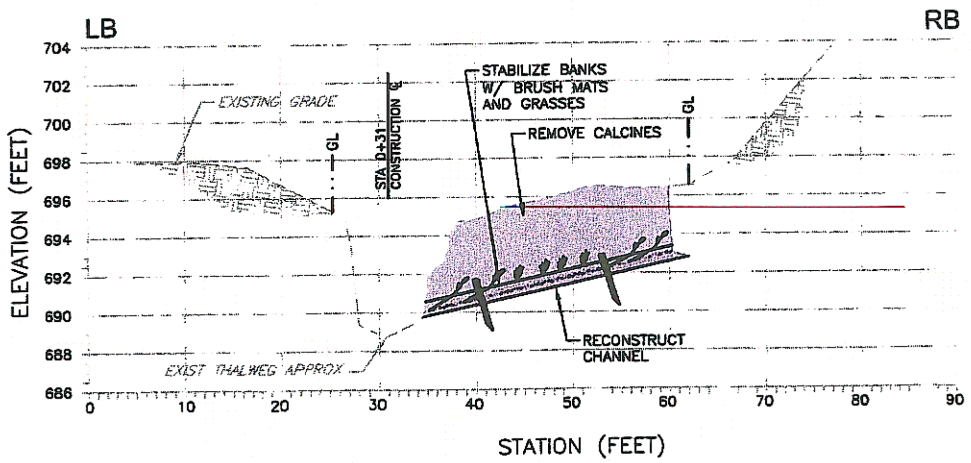
C C-3 RESTORATION CROSS-SECTION
STA 18+79.63 N.T.S.



D C-3 RESTORATION CROSS-SECTION
STA 20+77.28 N.T.S.



E C-4 RESTORATION CROSS-SECTION
STA 24+61.22 N.T.S.



F C-4 RESTORATION CROSS-SECTION
STA 25+23.49 N.T.S.

REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

1. SECTIONS LOOKING DOWNSTREAM

PWA
PHILIP WILLIAMS & ASSOCIATES, LTD.
720 CALIFORNIA STREET, SUITE 600
SAN FRANCISCO, CALIFORNIA 94108-2404
PHONE (415) 262-2300 FAX (415) 262-2303

DATE 07-10-08
DESIGN A. COLLISON
DRAWN E. WISNOSKY
CHECKED A. COLLISON

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 09/30/09
CIVIL
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

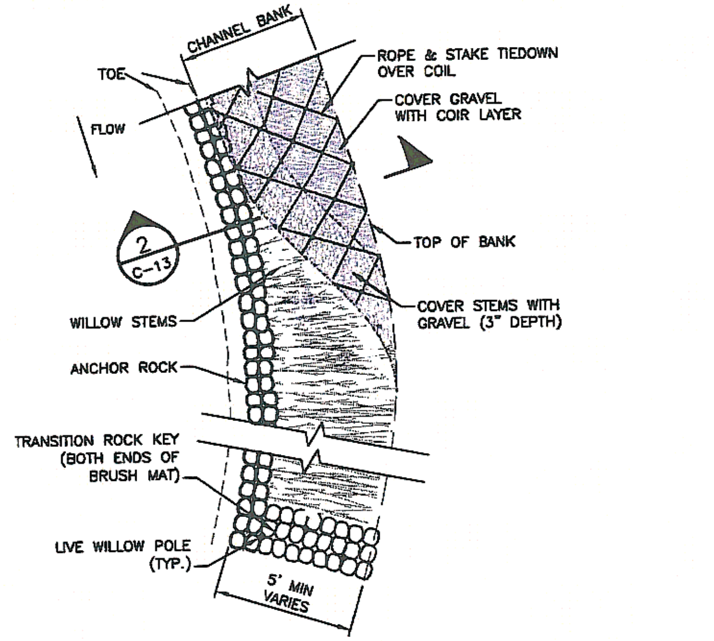
JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 – RECOMMENDED PROJECT

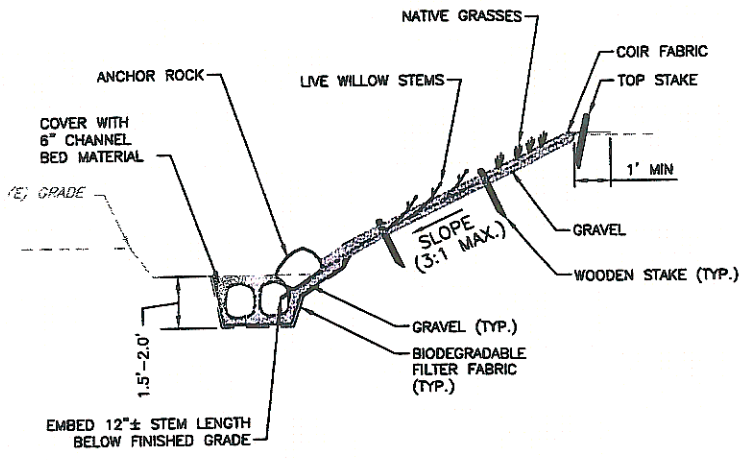
SITE B CHANNEL CROSS-SECTIONS

SCALE
NOT TO SCALE
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

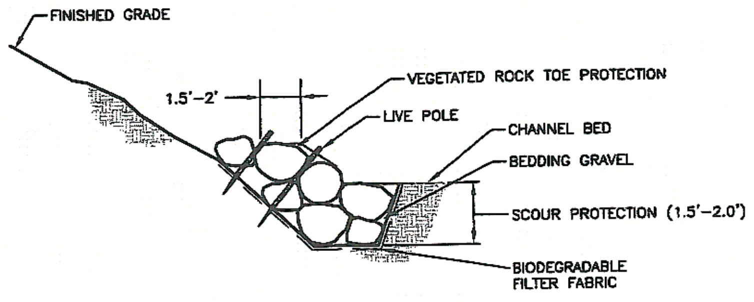
PROJECT NUMBER
91854002
SHEET CODE:
C-12
PAGE NUMBER:
23 OF 38


CHANNEL BANK
TOE
FLOW
ROPE & STAKE TIEDOWN OVER COIL
COVER GRAVEL WITH COIR LAYER
2
C-13
TOP OF BANK
WILLOW STEMS
COVER STEMS WITH GRAVEL (3" DEPTH)
ANCHOR ROCK
TRANSITION ROCK KEY (BOTH ENDS OF BRUSH MAT)
LIVE WILLOW POLE (TYP.)
5' MIN VARIES

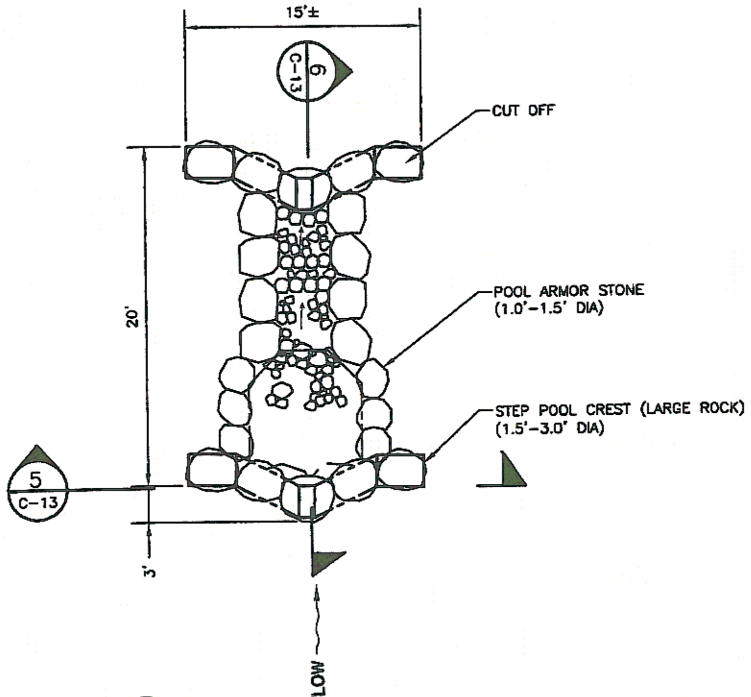
1 C-4 BRUSH MAT
TYPICAL PLAN N.T.S.



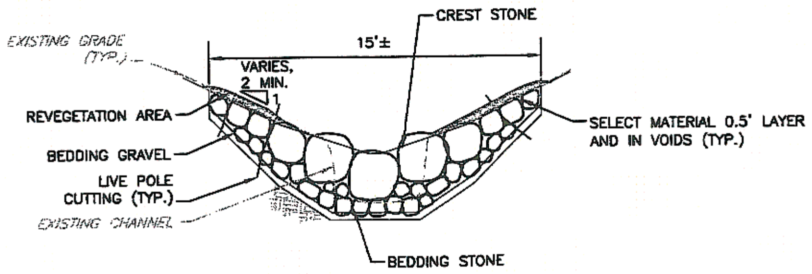
2 C-13 BRUSH MAT - LOOKING U/S
TYPICAL SECTION N.T.S.


FINISHED GRADE
1.5'-2'
VEGETATED ROCK TOE PROTECTION
LIVE POLE
CHANNEL BED
BEDDING GRAVEL
SCOUR PROTECTION (1.5'-2.0')
BIODEGRADABLE FILTER FABRIC

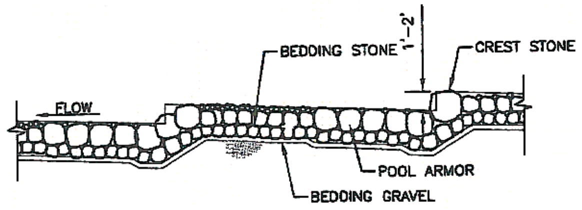
3 C-3, C-4 VEGETATED ROCK - LOOKING U/S
TOE PROTECTION N.T.S.


15'±
6
C-13
CUT OFF
20'
POOL ARMOR STONE (1.0'-1.5' DIA)
STEP POOL CREST (LARGE ROCK) (1.5'-3.0' DIA)
5
C-13
3'
FLOW

4 C-3, C-4 STEP POOL STRUCTURE
TYPICAL PLAN - SITE B N.T.S.



5 C-13 STEP POOL
TYPICAL SECTION AT CREST N.T.S.



6 C-13 STEP POOL
TYPICAL PROFILE N.T.S.

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

PWA
PHILIP WILLIAMS & ASSOCIATES, LTD.
720 CALIFORNIA STREET, SUITE 600
SAN FRANCISCO, CALIFORNIA 94108-2404
PHONE (415) 262-2300 FAX (415) 262-2303

DATE
07-10-08
DESIGN
A. COLLISON
DRAWN
E. WISNOS.
CHECKED
A. COLLISON

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
No. C65957
Exp. 09/30/09
07/10/08
PROJECT ENGINEER DATE

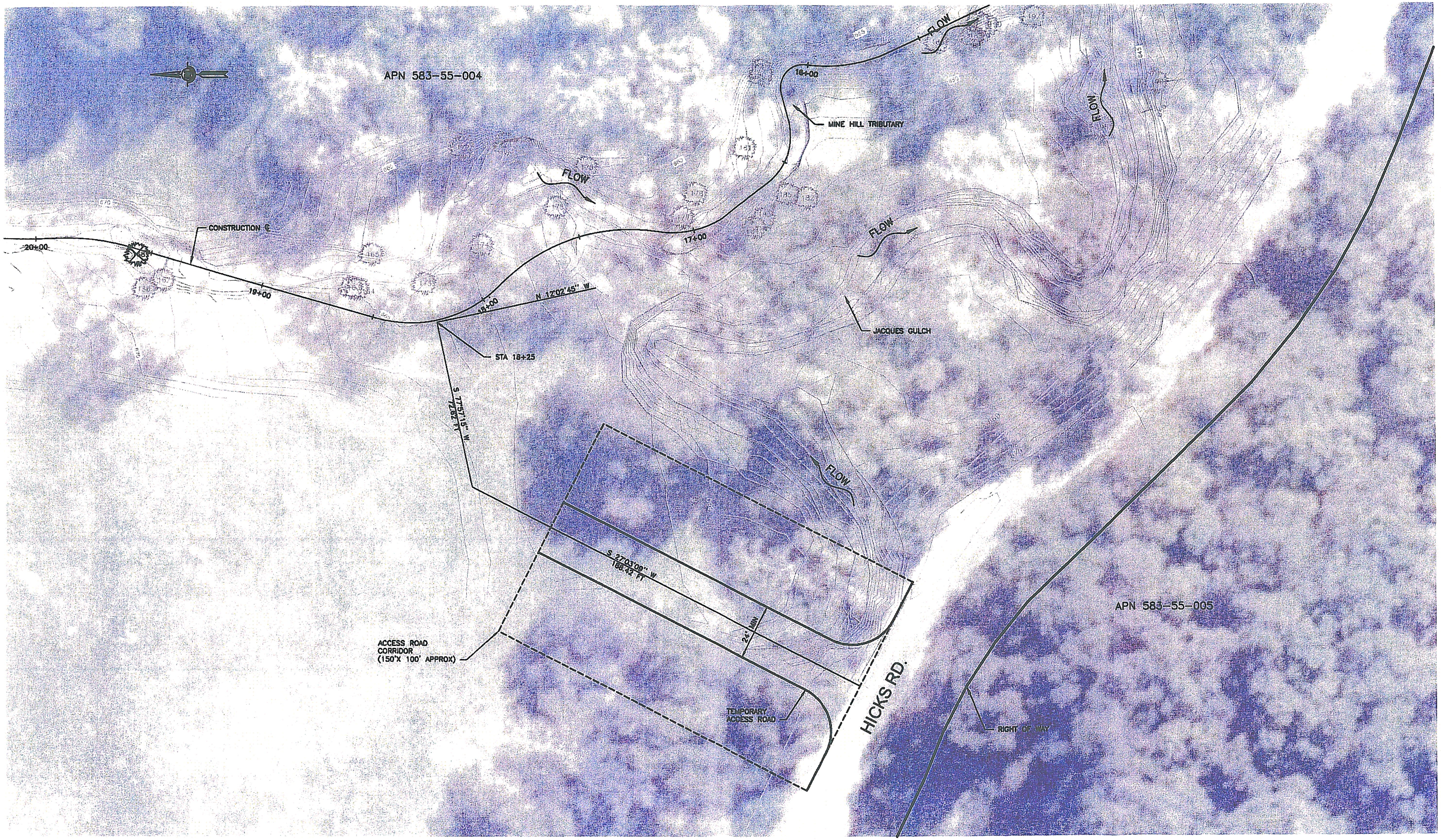
Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT
07/10/08
MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 1 – RECOMMENDED PROJECT
SITE B RESTORATION DETAILS

SCALE
NOT TO SCALE
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002
SHEET CODE:
C-13
PAGE NUMBER:
24 OF 38



REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			1. REFER TO SHEETS C-3 AND C-4 FOR SITE B RESTORATION PLAN

DATE
07-10-08
DESIGN
K.N.
DRAWN
L.P.
CHECKED
D.M.

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 09/30/09
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

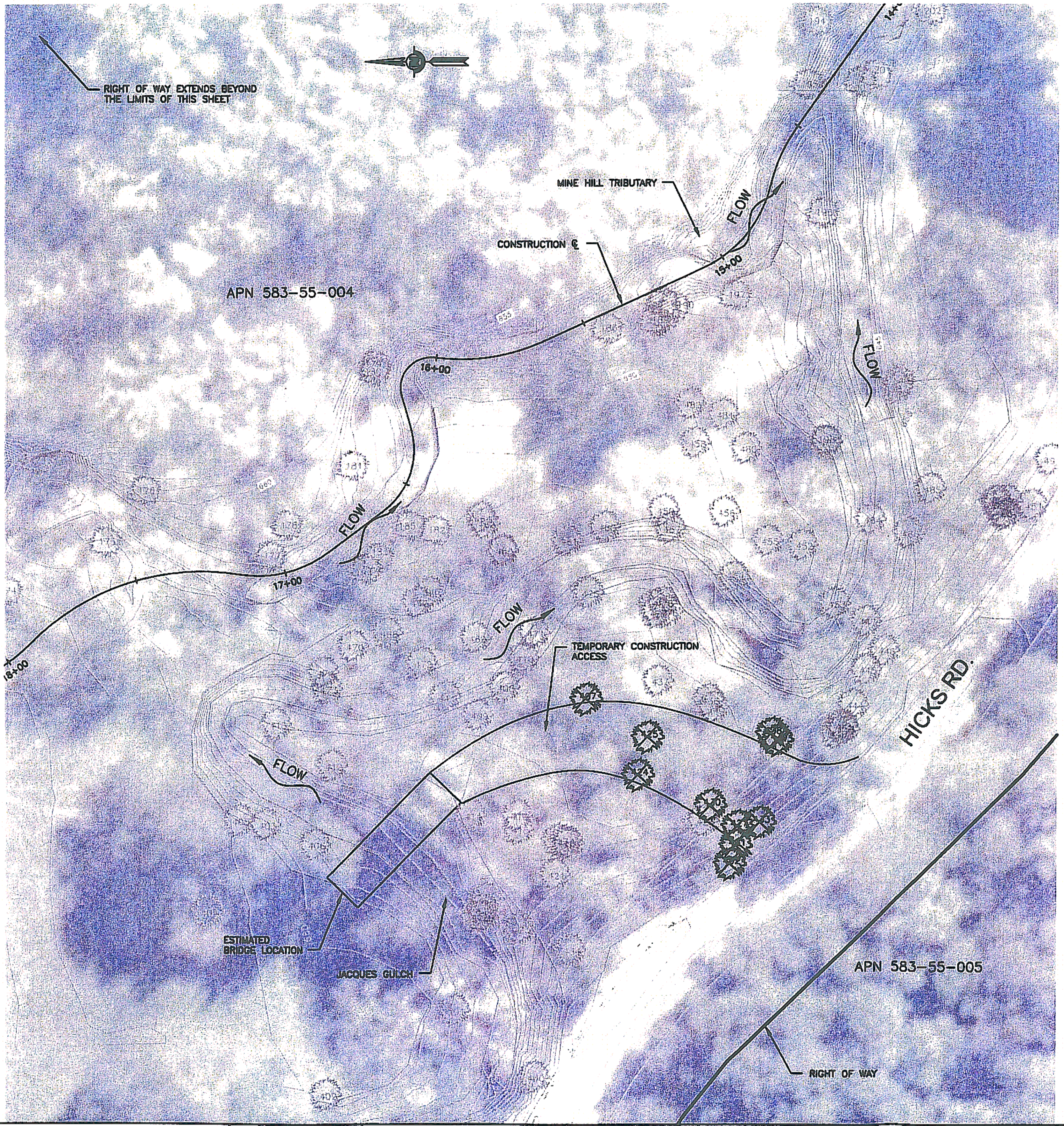
JACQUES GULCH
CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT
SITE B TEMPORARY CONSTRUCTION ACCESS PLAN
OPTION 1

SCALE
1"=20'
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002
SHEET CODE:
C-14

PAGE NUMBER:
25 OF 38



NO.	TREE DESCRIPTION	TREE TO BE REMOVED
400	OAK 8. IN.	
401	SYCAMORE 60. IN.	
402	OAK 26. IN.	
403	OAK 18. IN.	
404	OAK 12. IN.	
405	OAK 34. IN.	
406	BAY 16. IN.	
407	OAK 12. IN.	YES
408	OAK 13. IN.	
409	OAK 12. IN.	
410	MAPLE 12. IN.	
411	BAY 16. IN.	
412	OAK 26. IN.	
413	BAY 8. IN.	
414	BAY 20. IN.	
415	OAK 24. IN.	
416	OAK 24. IN.	
417	OAK 14. IN.	
418	OAK 14. IN.	
419	OAK 14. IN.	
420	BAY 22. IN.	
421	BAY 6. IN.	
422	BAY 6. IN.	
423	BAY 6. IN.	
424	BAY 12. IN.	YES
425	BAY 14. IN.	YES
426	BAY 14. IN.	
427	BAY 8. IN.	YES
428	MAPLE 18. IN.	
429	MAPLE 10. IN.	
430	MAPLE 6. IN.	YES
431	OAK 6. IN.	YES
432	OAK 6. IN.	YES
433	OAK 6. IN.	YES
434	OAK 18. IN.	
435	OAK 12. IN.	
436	OAK 12. IN.	
437	OAK 6. IN.	
438	OAK 20. IN.	YES
439	OAK 12. IN.	YES
440	BAY 20. IN.	
441	BAY 16. IN.	
442	BAY 10. IN.	
443	BAY 10. IN.	
444	BAY 10. IN.	
445	SYCAMORE 26. IN.	
446	SYCAMORE 8. IN.	
447	BAY 9. IN.	
448	OAK 24. IN.	
449	OAK 24. IN.	
450	OAK 24. IN.	
451	OAK 6. IN.	
452	OAK 18. IN.	
453	SYCAMORE 24. IN.	
454	SYCAMORE 60. IN.	
455	BAY 10. IN.	
456	BAY 18. IN.	
457	OAK 36. IN.	
458	OAK 24. IN.	

NO.	TREE DESCRIPTION	TREE TO BE REMOVED
459	BAY 10. IN.	
460	OAK 10. IN.	
461	OAK 6. IN.	
462	OAK 14. IN.	
463	OAK 16. IN.	
464	OAK 16. IN.	
465	OAK 8. IN.	
466	OAK 10. IN.	
467	OAK 12. IN.	
468	OAK 12. IN.	
469	BAY 10. IN.	
470	BAY 18. IN.	
471	OAK 36. IN.	
472	BAY 10. IN.	
473	OAK 40. IN.	
474	OAK 8. IN.	
475	BAY 12. IN.	
476	OAK 20. IN.	
477	OAK 18. IN.	
478	OAK 18. IN.	
479	OAK 12. IN.	
480	OAK 8. IN.	
481	OAK 8. IN.	
482	OAK 14. IN.	
483	OAK 14. IN.	
484	BAY 20. IN.	
485	BAY 22. IN.	
486	OAK 40. IN.	
487	OAK 40. IN.	
488	OAK 20. IN.	
489	OAK 20. IN.	
490	OAK 20. IN.	
491	MAPLE 6. IN.	

REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

1. REFER TO SHEETS C-3 AND C-4 FOR SITE B RESTORATION PLAN

DATE 07-10-08
DESIGN K.N.
DRAWN L. PENILL
CHECKED D.M.

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
No. C49957
Exp. 09/30/09
PROJECT ENGINEER DATE 07/10/08

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
PROJECT ENGINEER 07/10/08 MM/DD/YY

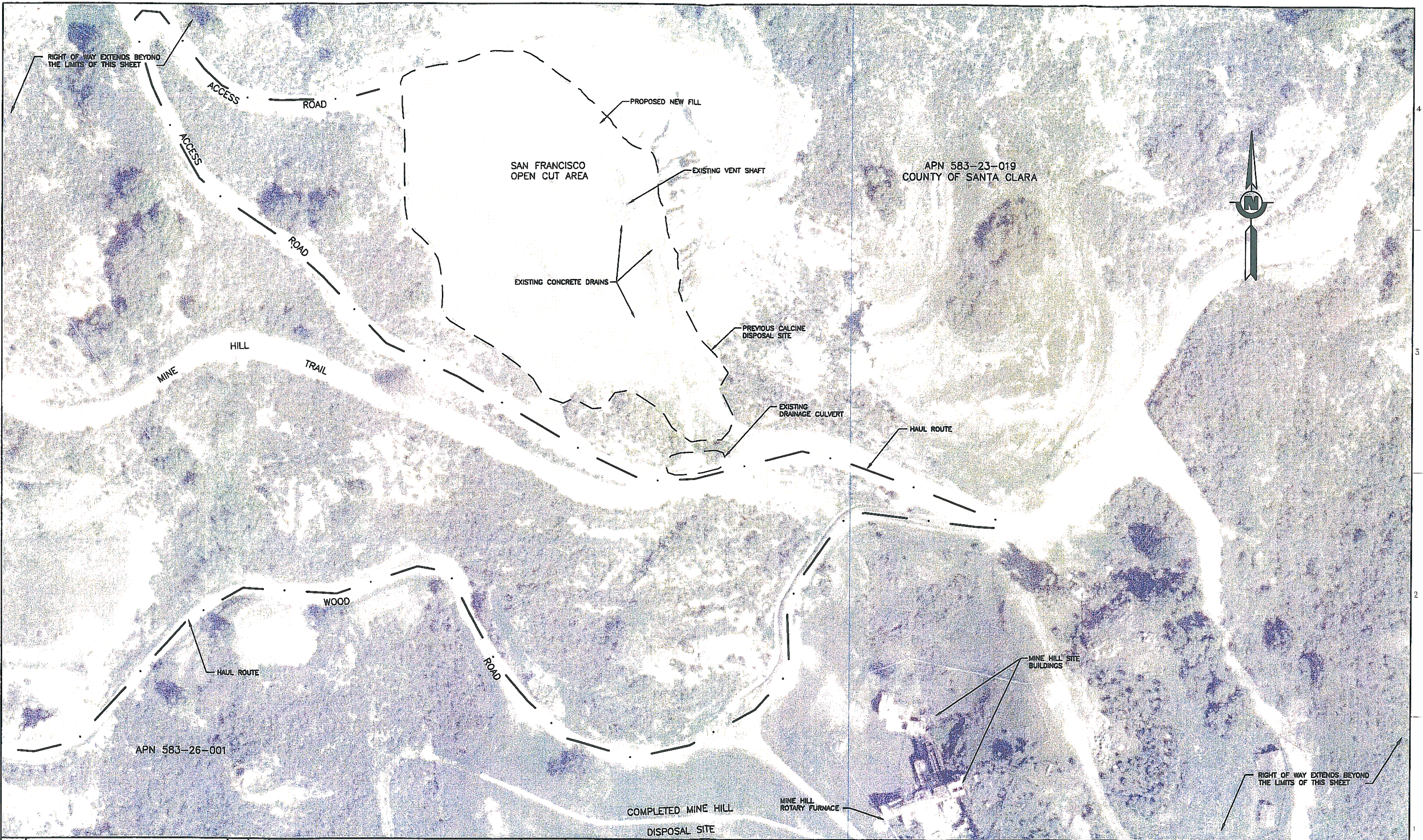
PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT
SITE B TEMPORARY CONSTRUCTION ACCESS PLAN
OPTION 2

SCALE 1"=20"
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002
SHEET CODE: C-15
PAGE NUMBER: 26 OF 38


RIGHT OF WAY EXTENDS BEYOND THE LIMITS OF THIS SHEET
ACCESS ROAD
ACCESS ROAD
PROPOSED NEW FILL
SAN FRANCISCO OPEN CUT AREA
EXISTING VENT SHAFT
APN 583-23-019 COUNTY OF SANTA CLARA
N
EXISTING CONCRETE DRAINS
PREVIOUS CALCINE DISPOSAL SITE
MINE HILL TRAIL
EXISTING DRAINAGE CULVERT
HAUL ROUTE
WOOD ROAD
HAUL ROUTE
MINE HILL SITE BUILDINGS
APN 583-26-001
RIGHT OF WAY EXTENDS BEYOND THE LIMITS OF THIS SHEET
COMPLETED MINE HILL DISPOSAL SITE
MINE HILL ROTARY FURNACE

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

DATE 07-10-08
DESIGN R.V.
DRAWN J.J.
CHECKED R.V.

ENGINEERING CERTIFICATION
VENKATESAN NARASIMHAN
No. 44870
3/31/10
7/14/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

PROJECT NAME AND SHEET DESCRIPTION:

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT CONSOLIDATION SITE PLAN EXISTING CONDITIONS

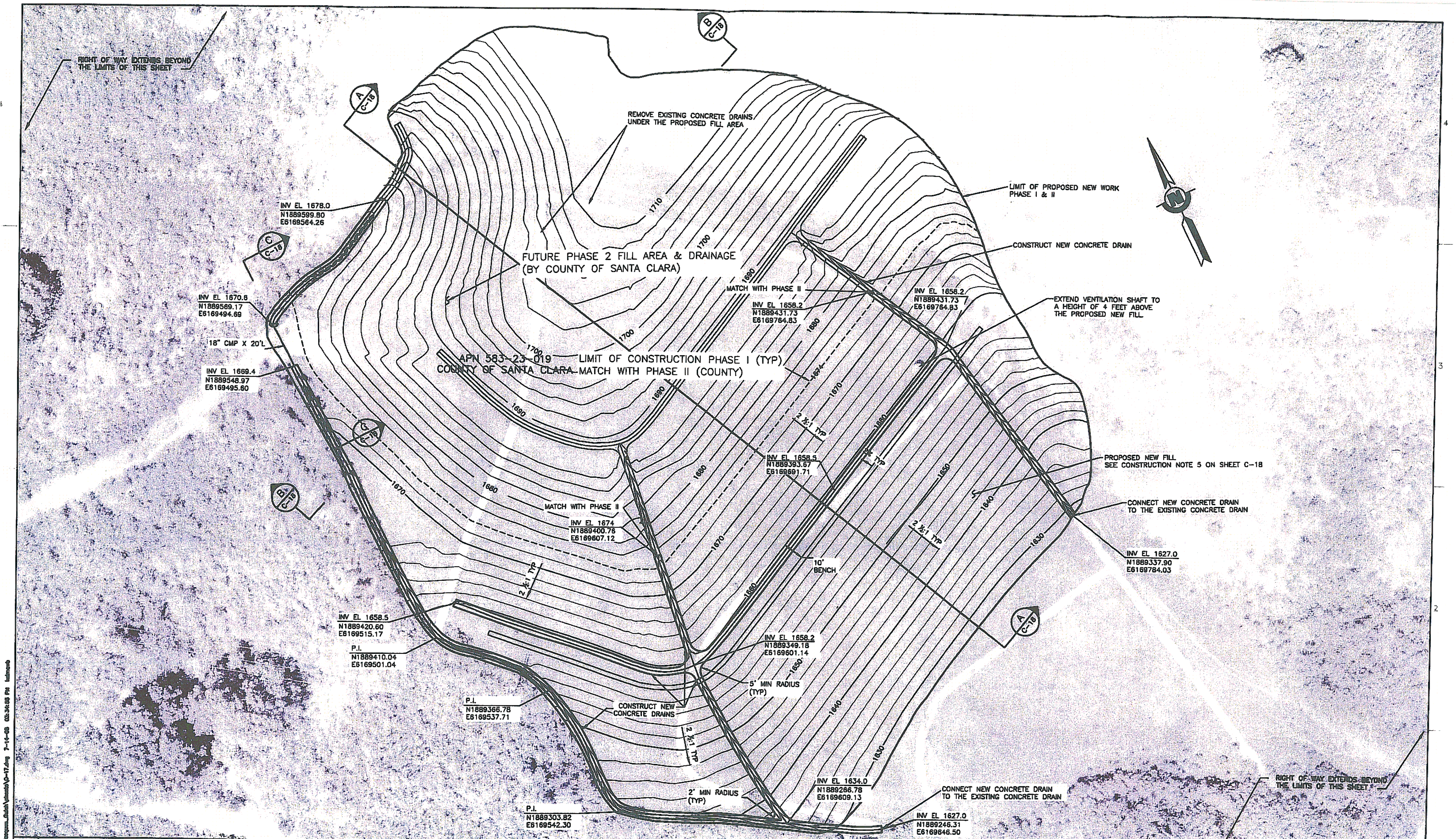
SCALE
SCALE 1:50

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002

SHEET CODE:
C-16

PAGE NUMBER:
27 OF 38



REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

1. SCVWD IS RESPONSIBLE FOR PHASE 1 CONSTRUCTION ONLY
2. COUNTY OF SANTA CLARA IS RESPONSIBLE FOR PHASE 2 CONSTRUCTION.

DATE	07-10-08
DESIGN	R.V.
DRAWN	P.N.
CHECKED	R.V.

ENGINEERING CERTIFICATION

No. 44870

VENKATESAN NARASIMHAN

7/14/08

PROJECT ENGINEER DATE

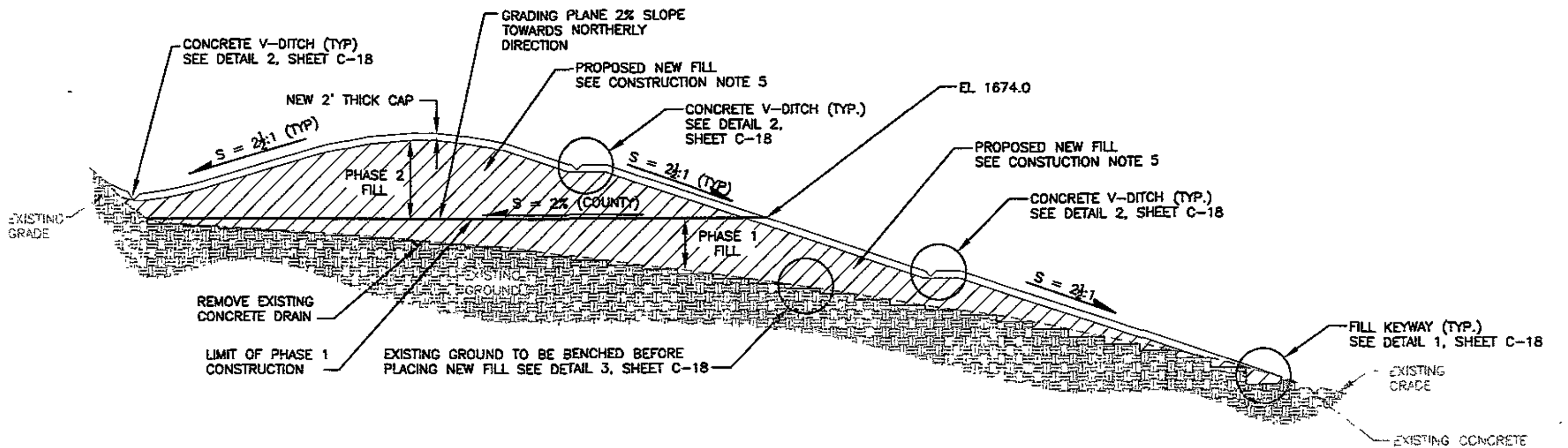
Santa Clara Valley Water District

PROJECT NAME AND SHEET DESCRIPTION:

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT
CONSOLIDATION SITE
PHASE 1 & 2 GRADING PLAN

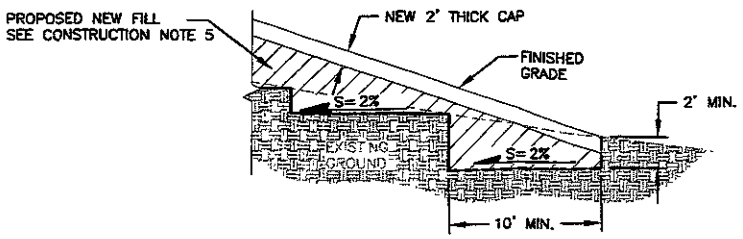
SCALE	1" = 20'
PROJECT NUMBER	91854002
VERIFY SCALES	0 1" BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY
SHEET CODE:	C-17
PAGE NUMBER:	28 OF 38



SECTION (A / C–17) PROPOSED FILL (PHASE I & II)

NTS

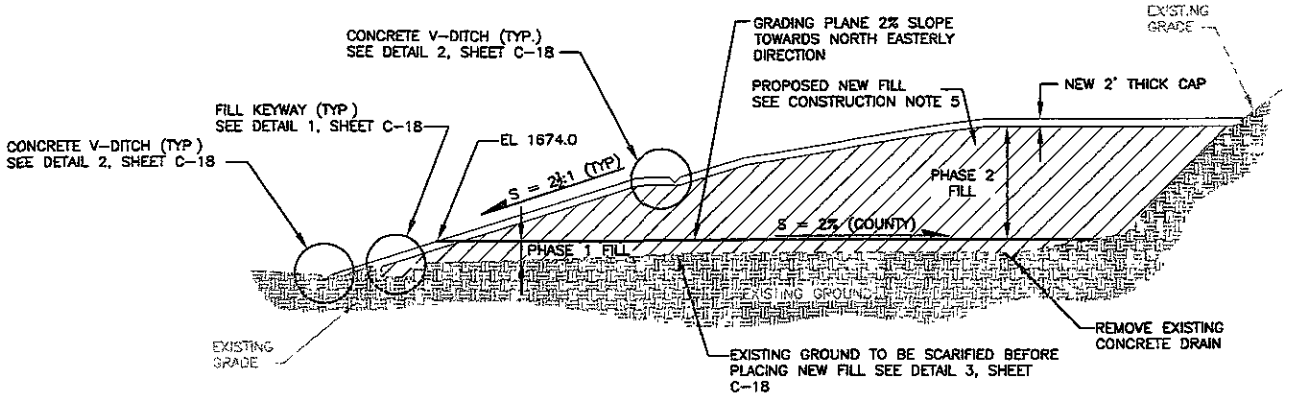
SEE CONSTRUCTION NOTE 4



DETAIL (1 / C–18) FILL KEYWAY

NTS

SEE CONSTRUCTION NOTES 1 & 4



SECTION (B / C–17) PROPOSED FILL

NTS

SEE CONSTRUCTION NOTE 4

CONSTRUCTION NOTES:

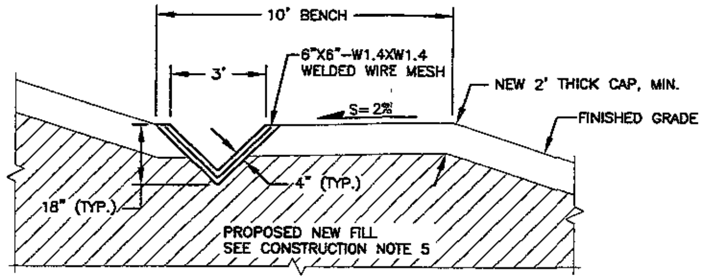
1) KEYWAY TO BE SCARIFIED PRIOR TO PLACING FILL.

2) CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSION STRENGTH OF 2,500 PSI AT 28 DAYS.

3) GROUND SHALL BE PRE–WETTED TO THE SATISFACTION OF THE ENGINEER PRIOR TO PLACING CONCRETE. MOISTURE LOSS RETARDANT SHALL BE USED WHEN REQUIRED BY THE ENGINEER.

4) PROPOSED FILL SHALL BE COMPACTED TO 85% MIN. RELATIVE COMPACTION.

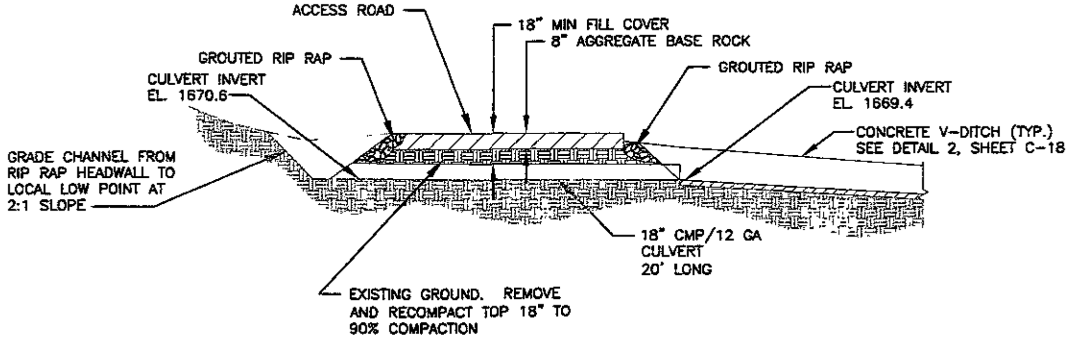
5) SEE TREADWELL & ROLLO ENVIRONMENTAL AND GEOTECHNICAL CONSULTANTS REPORT TITLED "GEOTECHNICAL INVESTIGATION ALMADEN QUICKSILVER PARK, SAN FRANCISCO OPEN CUT AREA DISPOSAL SITE, SANTA CLARA , CALIFORNIA"



DETAIL (2 / C–18) CONCRETE V–DITCH

NTS

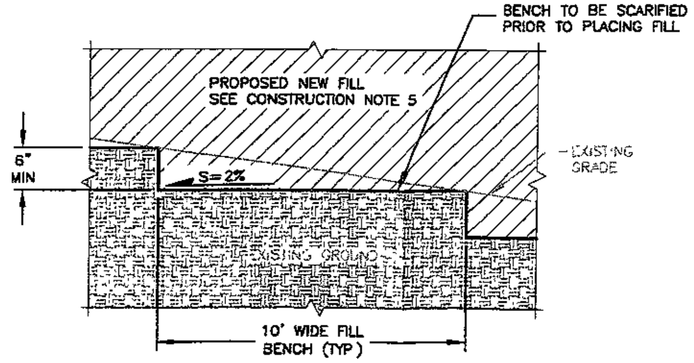
SEE CONSTRUCTION NOTES 2, 3 & 4



SECTION (C / C–17) PROPOSED CULVERT UNDER ACCESS ROAD

NTS

SEE CONSTRUCTION NOTE 2



DETAIL (3 / C–18) CUT BENCHES INTO EXISTING GROUND (TYP) PRIOR TO NEW FILL PLACEMENT

SEE CONSTRUCTION NOTE 4

REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

1. SCVWD IS RESPONSIBLE FOR PHASE 1 CONSTRUCTION ONLY
2. COUNTY OF SANTA CLARA IS RESPONSIBLE FOR PHASE 2 CONSTRUCTION.

DATE	07–10–08
DESIGN	R.V.
DRAWN	J.J.
CHECKED	R.V.

ENGINEERING CERTIFICATION

VENKATESAN NARASIMHAN No. 44870 3/31/10 CIVIL

7/14/08

PROJECT ENGINEER DATE

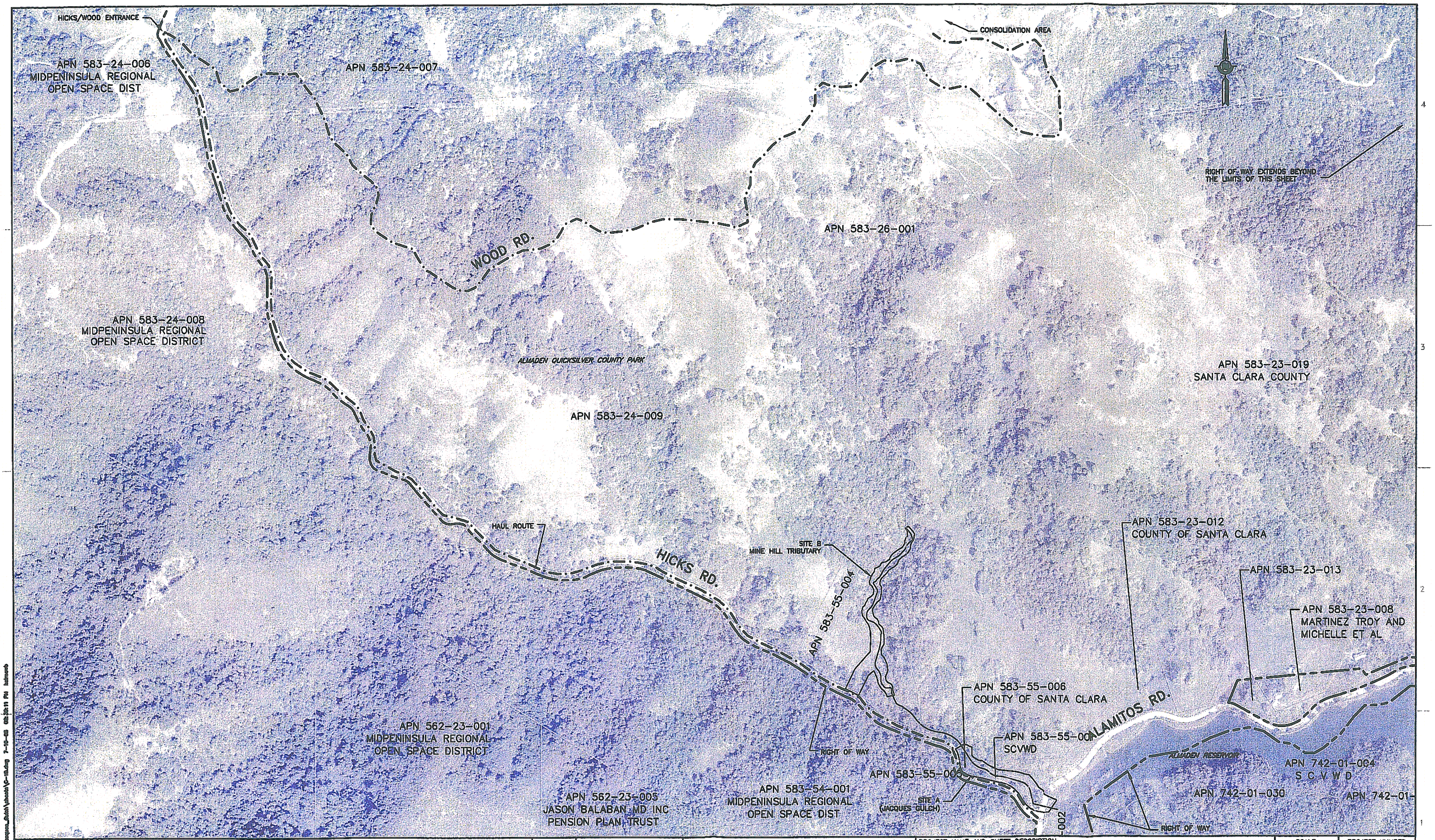
Santa Clara Valley Water District

PROJECT NAME AND SHEET DESCRIPTION:

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 1 – RECOMMENDED PROJECT
CONSOLIDATION SITE
SECTIONS AND DETAILS

SCALE	NOT TO SCALE
VERIFY SCALES	0 1" BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY
PROJECT NUMBER	91854002
SHEET CODE:	C–18
PAGE NUMBER:	29 OF 38

K:\Active Projects\WP-91854002\Jacques_Gulch\sheets\D-18.dwg 7-14-08 03:38:48 PM kelmanb



REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

DATE 07-10-08

DESIGN K.N.

DRAWN J.F.

CHECKED D.M.

ENGINEERING CERTIFICATION

MICHAEL STUART THOMAS

No. [illegible]57

Exp. 09/30/09

07/10/08

PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT

07/10/08

PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT

HAUL ROUTE

SCALE 1"=300'

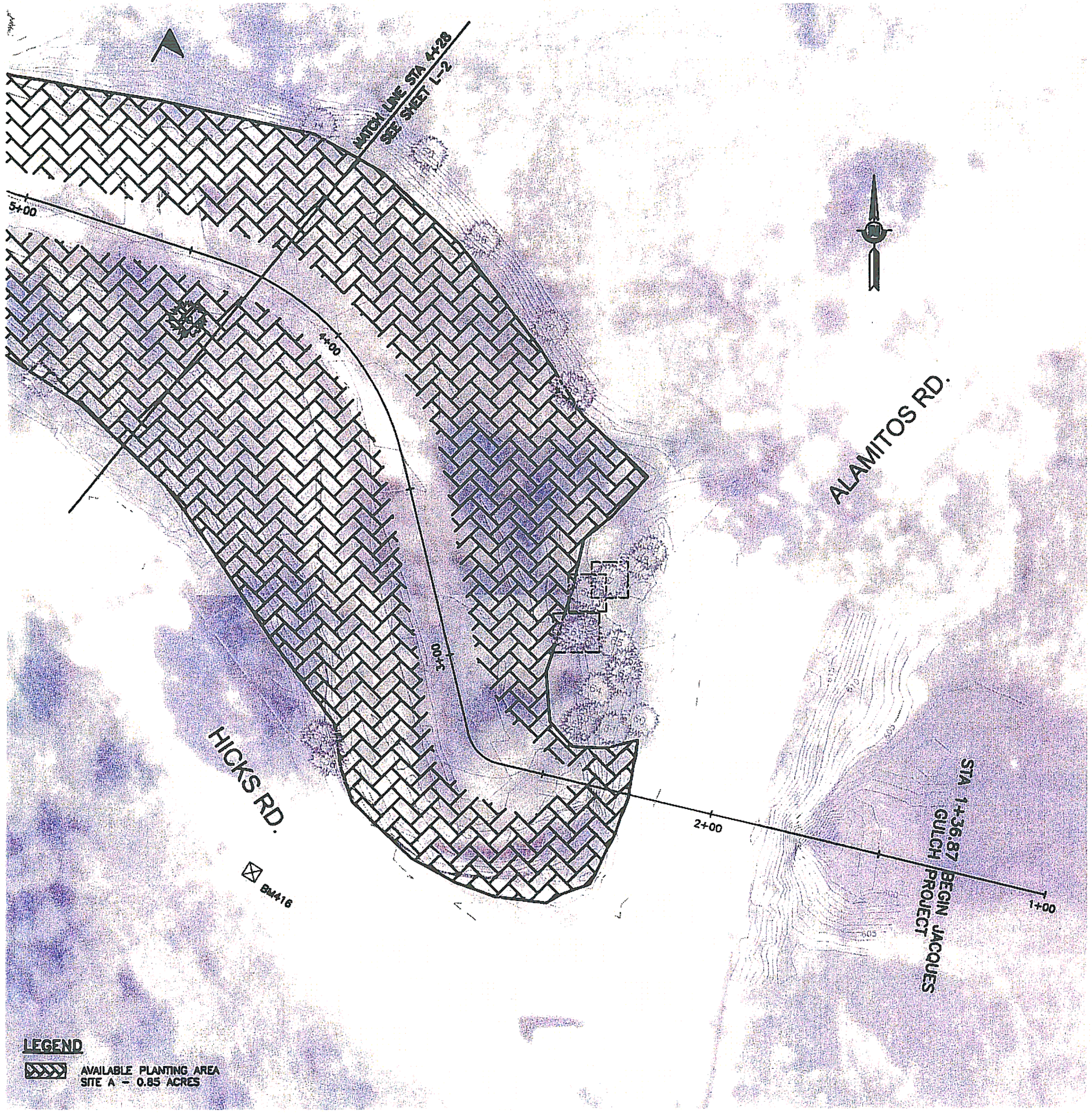
VERIFY SCALES

0 1"

BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002

SHEET CODE: C-19



REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

wra
ENVIRONMENTAL CONSULTANTS
2169-G East Francisco Blvd.
San Rafael, California 94901
PH: (415) 454-8868

DATE	07-10-08
DESIGN	KN
DRAWN	MW_MB
CHECKED	DM

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
No. C48557
Exp. 09/30/09
PROJECT ENGINEER DATE 07/10/08

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER 07/10/08 MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 – RECOMMENDED PROJECT

SITE A PLANTING PLAN

SCALE	1"=20'
VERIFY SCALES	0 1" BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY
PROJECT NUMBER	91854002
SHEET CODE:	L-1
PAGE NUMBER:	31 OF 38

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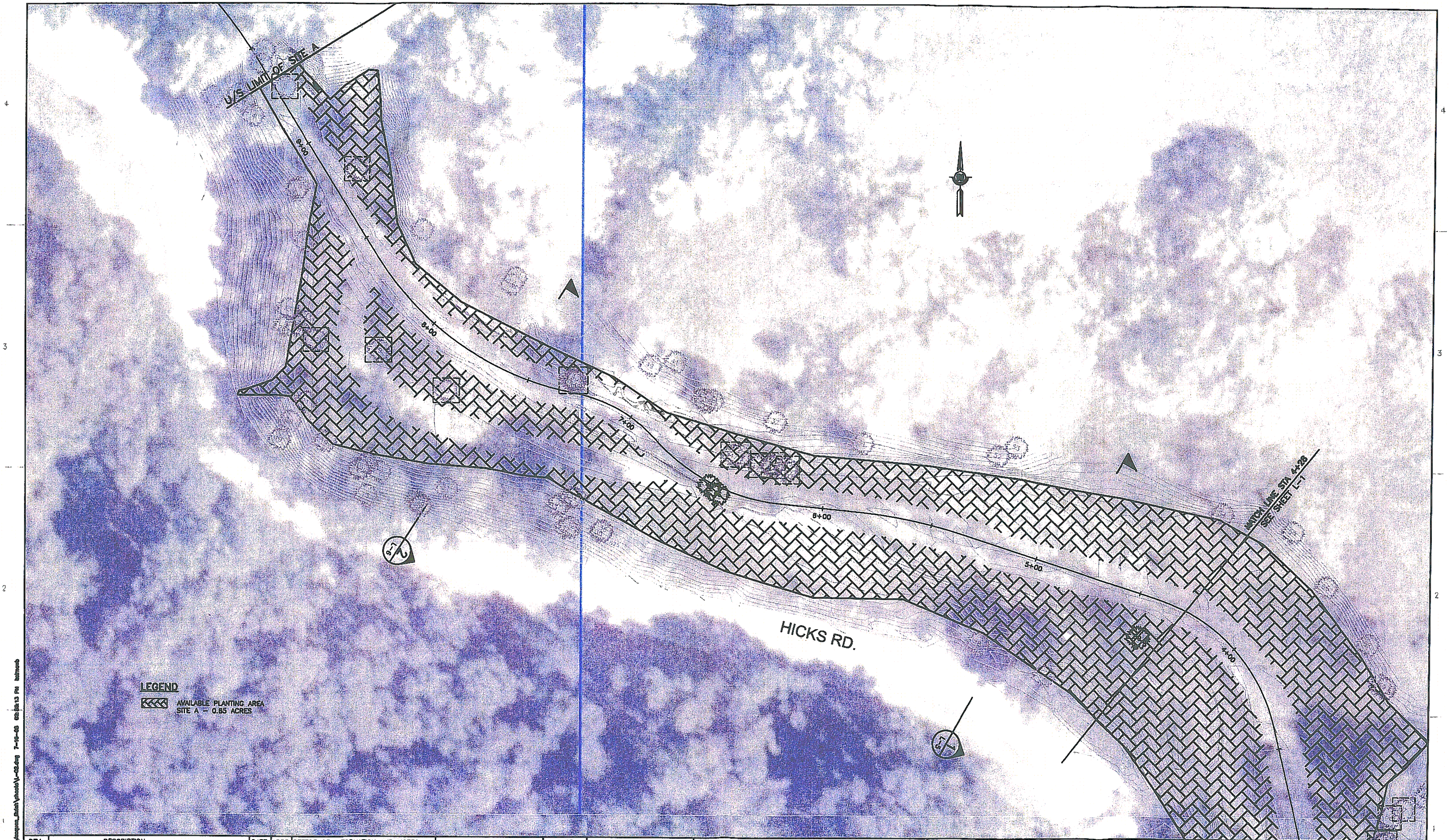

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

wra
ENVIRONMENTAL CONSULTANTS
2169-G East Francisco Blvd.
San Rafael, California 94901
PH: (415) 454-8868

DATE 07-10-08
DESIGN KN
DRAWN MW_MB
CHECKED DM

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
No. C48557
Exp. 09/30/09
PROJECT ENGINEER 07/10/08 DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
PROJECT ENGINEER 07/10/08 MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 – RECOMMENDED PROJECT

SITE A PLANTING PLAN

SCALE 1"=20'
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002
SHEET CODE: L-2
PAGE NUMBER: 32 OF 38

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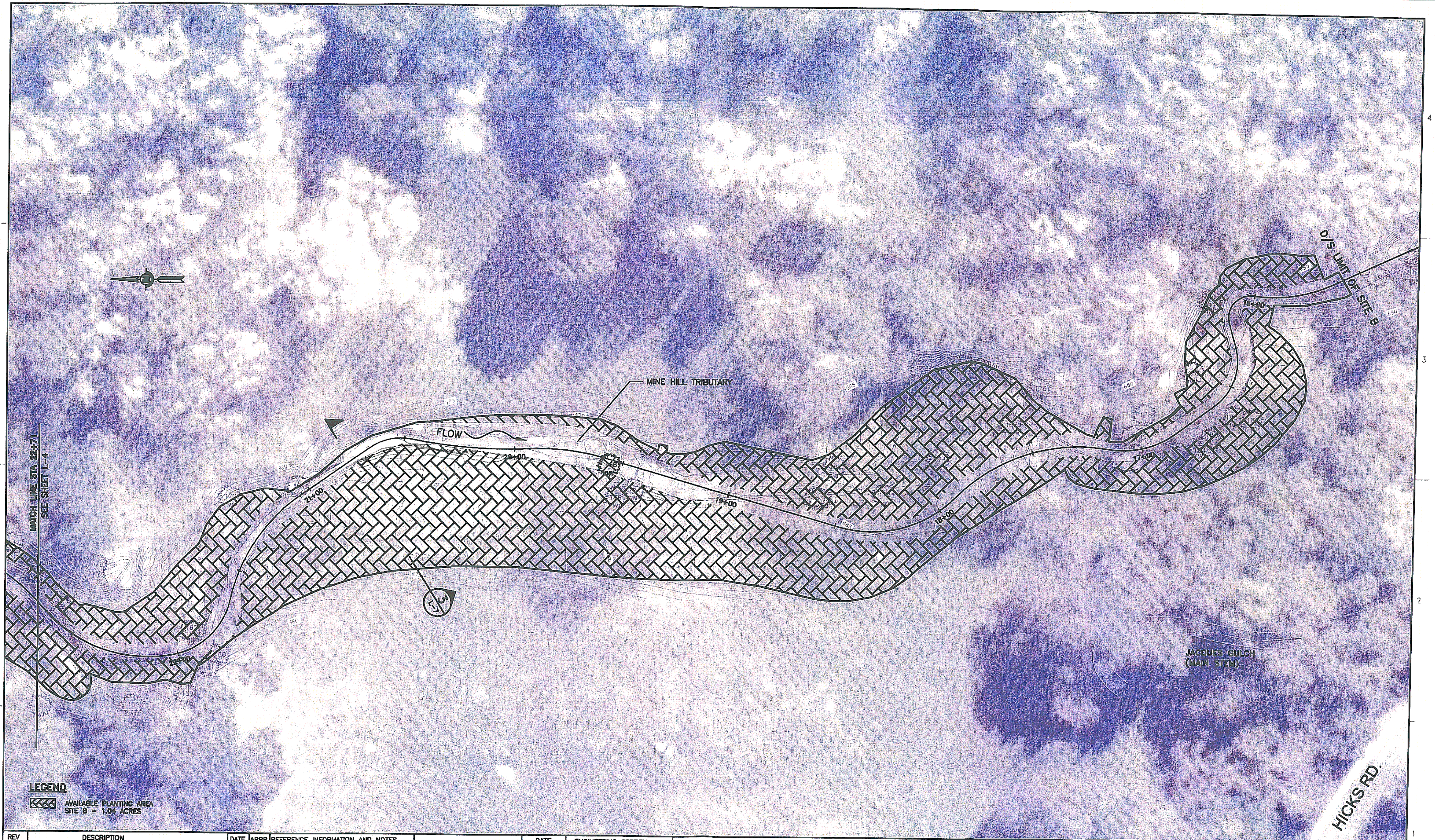


REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

wra
ENVIRONMENTAL CONSULTANTS
2169-C East Francisco Blvd.
San Rafael, California 94901
PH: (415) 454-8868

DATE	07-10-08
DESIGN	KN
DRAWN	MW_MB
CHECKED	DM

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 09/30/09
CIVIL
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT

SITE B PLANTING PLAN

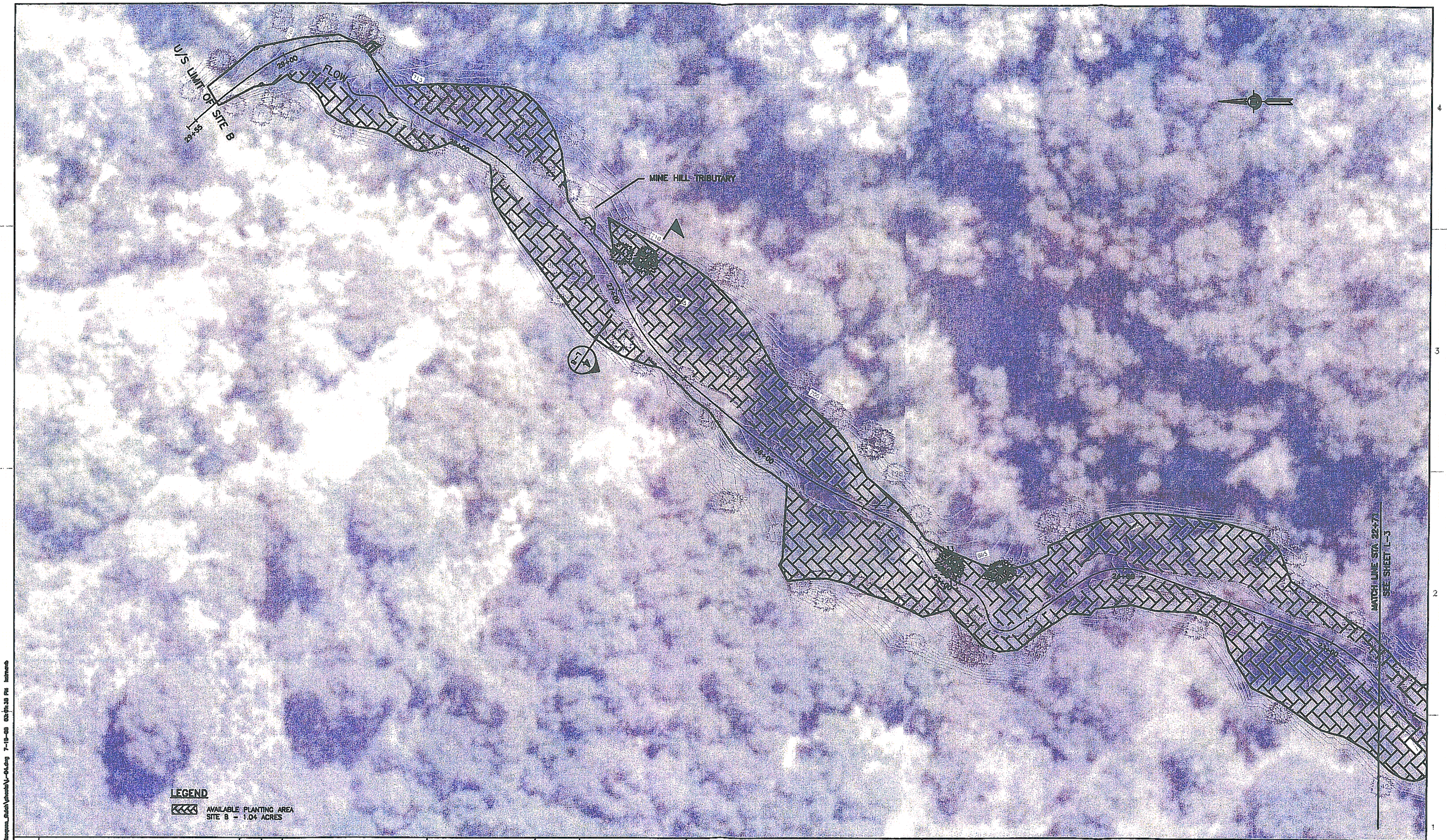
SCALE
1"=20'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002

SHEET CODE:
L-3

PAGE NUMBER:
33 OF 38



REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

WRA
ENVIRONMENTAL CONSULTANTS
2169-G East Francisco Blvd.
San Rafael, California 94901
PH: (415) 454-8868

DATE	07-10-08
DESIGN	KN
DRAWN	MW_MB
CHECKED	DM

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 09/30/09
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 - RECOMMENDED PROJECT

SITE B PLANTING PLAN

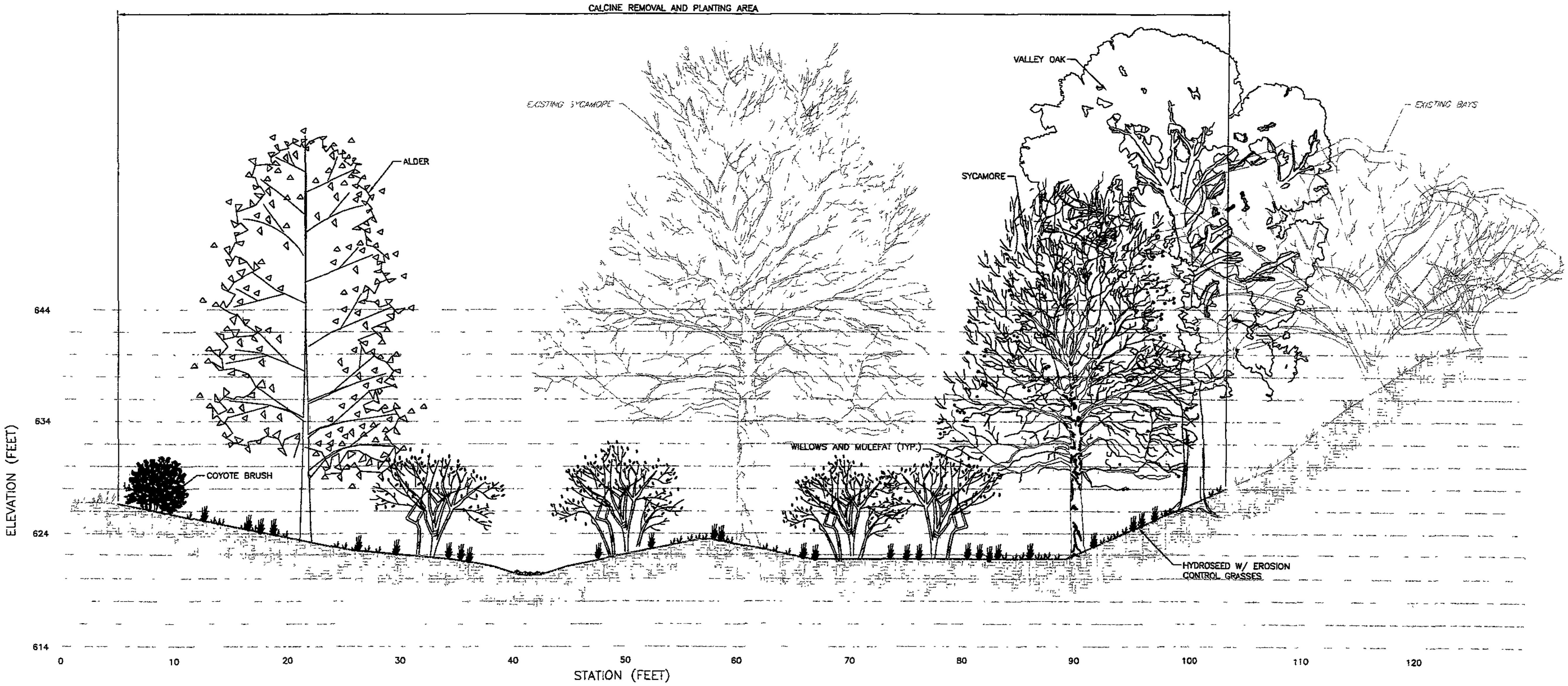
SCALE 1"=20'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002

SHEET CODE: L-4

PAGE NUMBER: 34 OF 38



1 L-2 RESTORATION CROSS-SECTION

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

wra
ENVIRONMENTAL CONSULTANTS
2169-G East Francisco Blvd.
San Rafael, California 94901
PH: (415) 454-8868

DATE 07-10-08
DESIGN KN
DRAWN MW_MB
CHECKED DM

ENGINEERING CERTIFICATION
REGISTERED PROFESSIONAL ENGINEER MICHAEL STUART THOMAS No. C56957 Exp. 09/30/09 CIVIL STATE OF CALIFORNIA
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION
JACQUES GULCH
CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 1 - RECOMMENDED PROJECT
SITE A LANDSCAPE CROSS-SECTIONS

SCALE 1"=-5'
VERIFY SCALES 0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002
SHEET CODE: L-5
PAGE NUMBER: 35 OF 38

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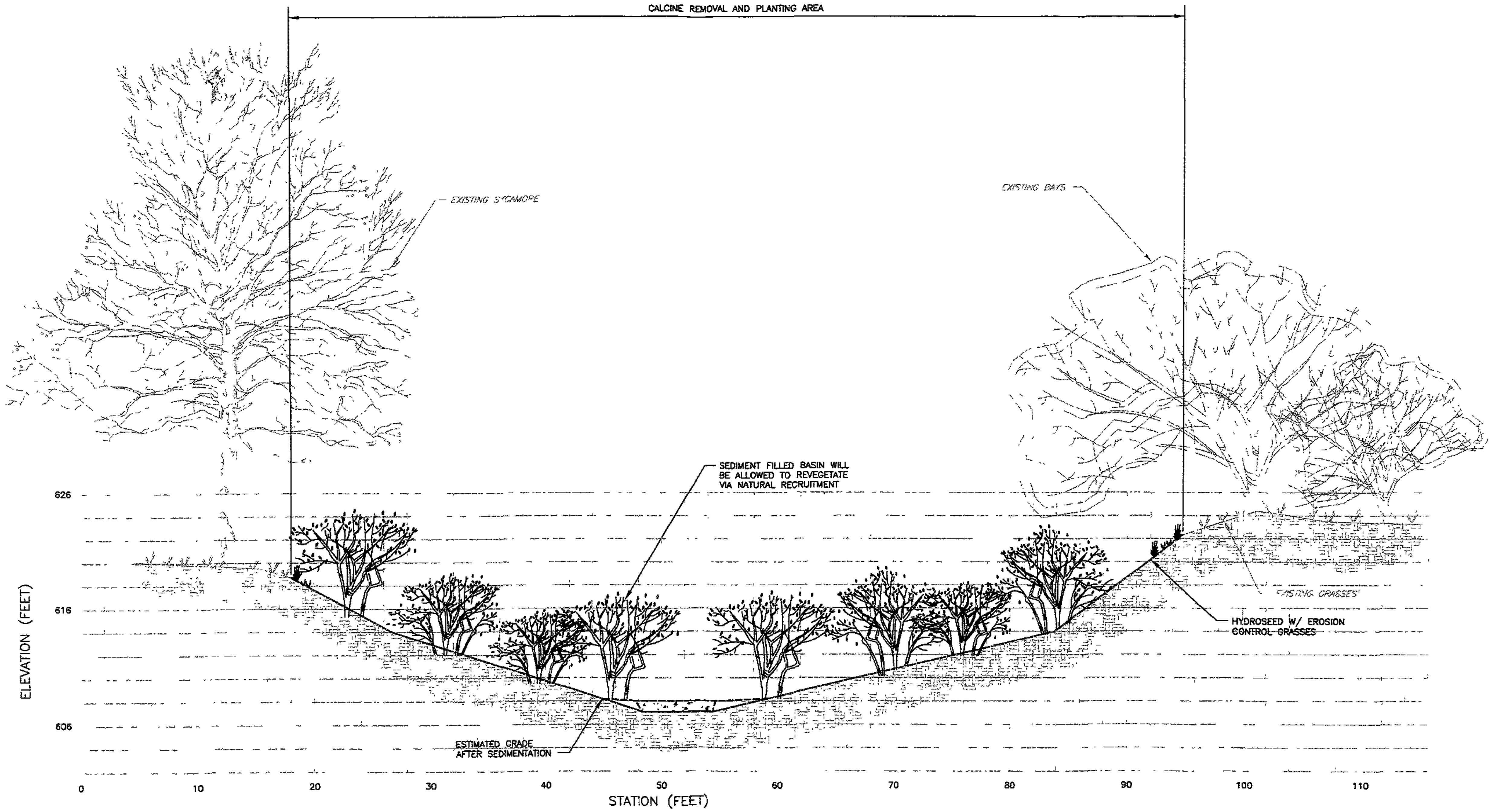

CALCINE REMOVAL AND PLANTING AREA
EXISTING SYCAMORE
EXISTING BAYS
SEDIMENT FILLED BASIN WILL BE ALLOWED TO REVEGETATE VIA NATURAL RECRUITMENT
EXISTING GRASSES
HYDROSEED W/ EROSION CONTROL GRASSES
ESTIMATED GRADE AFTER SEDIMENTATION
ELEVATION (FEET)
626
616
606
0
10
20
30
40
50
60
70
80
90
100
110
STATION (FEET)

2
L-2
RESTORATION CROSS-SECTION

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

wra
ENVIRONMENTAL CONSULTANTS
2169-G East Francisco Blvd.
San Rafael, California 94901
PH: (415) 454-8868

DATE 07-10-08
DESIGN KN
DRAWN MW_MB
CHECKED DM

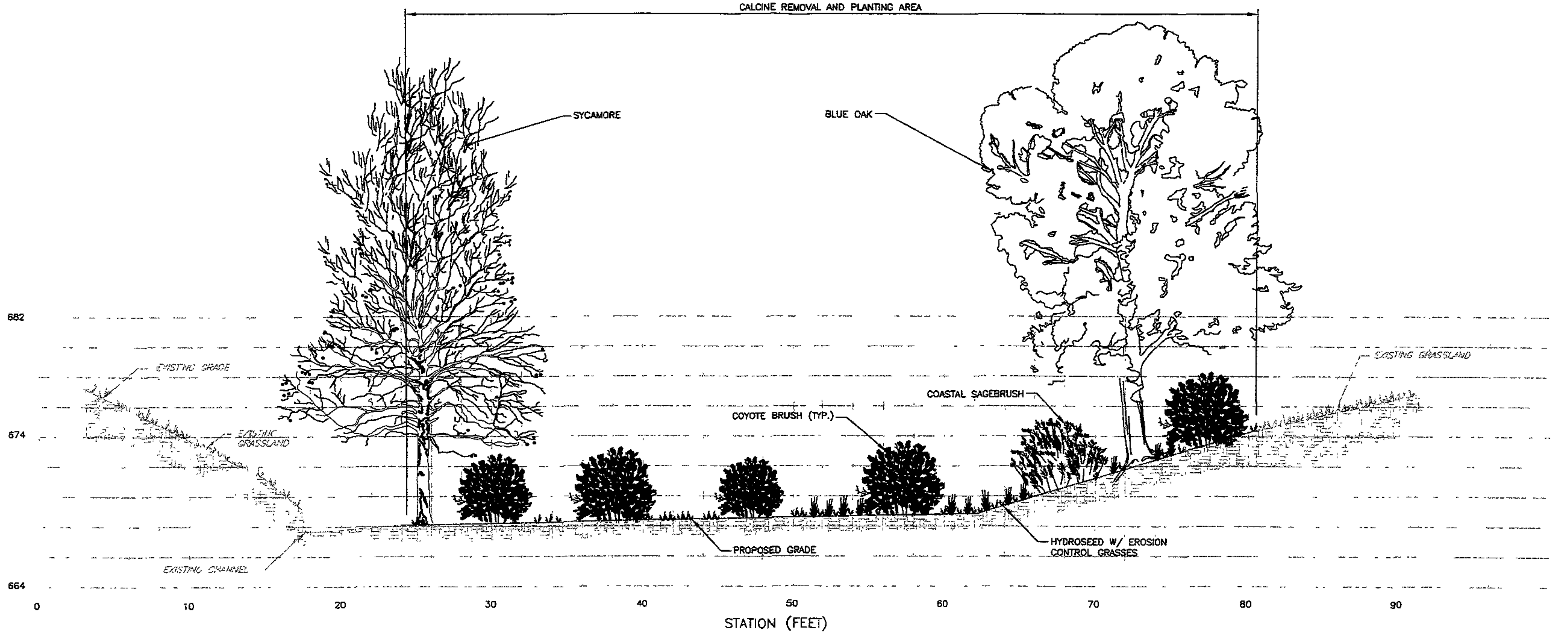
ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
No. C-48957
Exp. 09/30/09
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION
JACQUES GULCH
CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 1 - RECOMMENDED PROJECT
SITE A LANDSCAPE CROSS-SECTIONS

SCALE 1"=5'
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91845002
SHEET CODE: L-6
PAGE NUMBER: 36 OF 38



3 / L-3 RESTORATION CROSS-SECTION

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

wra
ENVIRONMENTAL CONSULTANTS
2169-G East Francisco Blvd.
San Rafael, California 94901
PH: (415) 454-8868

DATE 07-10-08
DESIGN KN
DRAWN MW_MB
CHECKED DM

ENGINEERING CERTIFICATION
REGISTERED PROFESSIONAL ENGINEER
MICHAEL STUART THOMAS
No. C58957
Exp. 09/30/09
CIVIL
STATE OF CALIFORNIA
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

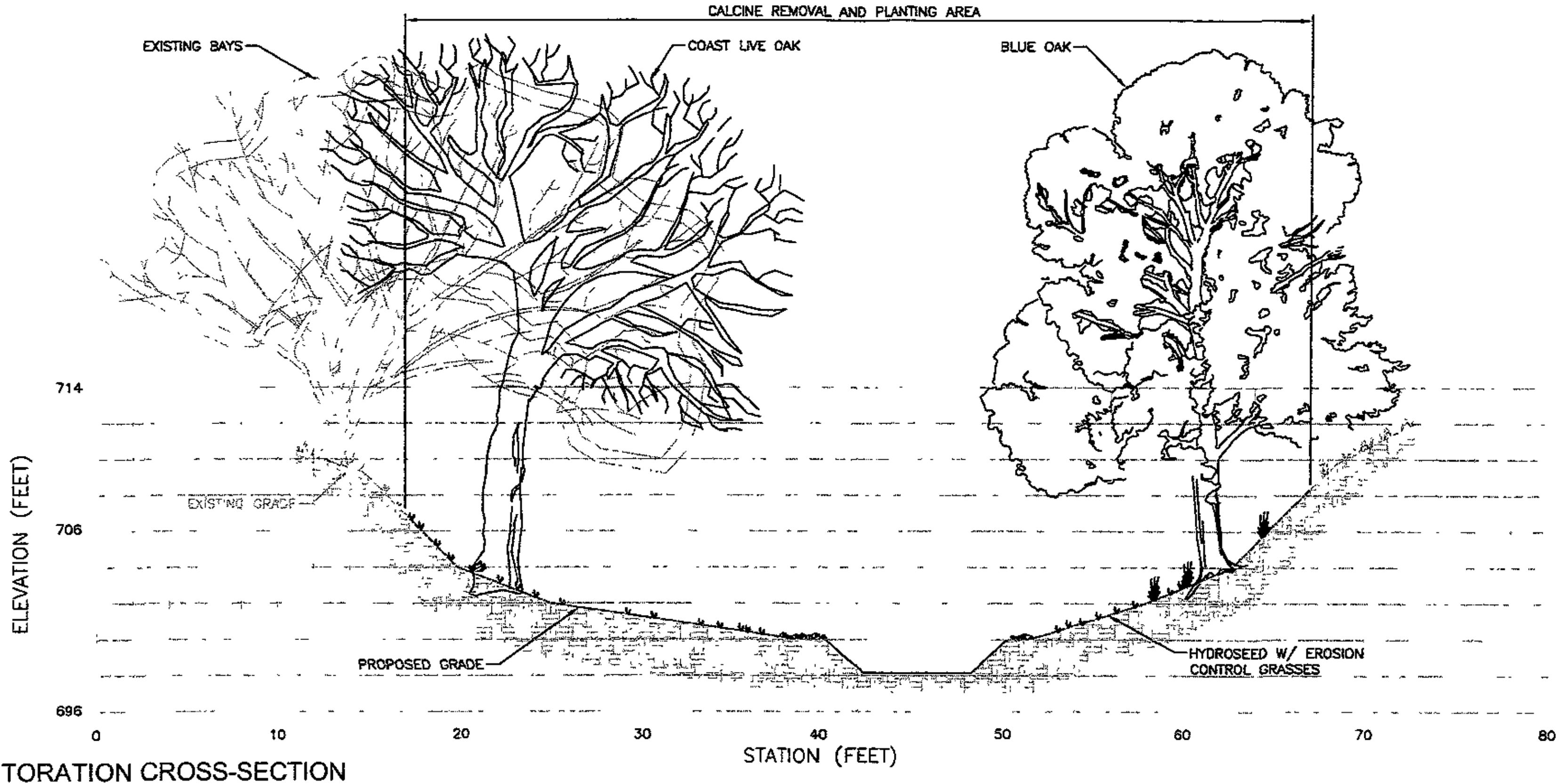
JACQUES GULCH
CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 1 – RECOMMENDED PROJECT

SITE B LANDSCAPE CROSS-SECTION

SCALE 1"=4'
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002
SHEET CODE: L-7
PAGE NUMBER: 37 OF 38



4
L-4
RESTORATION CROSS-SECTION

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

wra
ENVIRONMENTAL CONSULTANTS
2169-G East Francisco Blvd.
San Rafael, California 94901
PH: (415) 454-8868

DATE	07-10-08
DESIGN	KN
DRAWN	MW_MB
CHECKED	DM

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 09/30/09
PROJECT ENGINEER 07/10/08 DATE

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
PROJECT ENGINEER 07/10/08 MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 1 - RECOMMENDED PROJECT
SITE B LANDSCAPE CROSS-SECTION

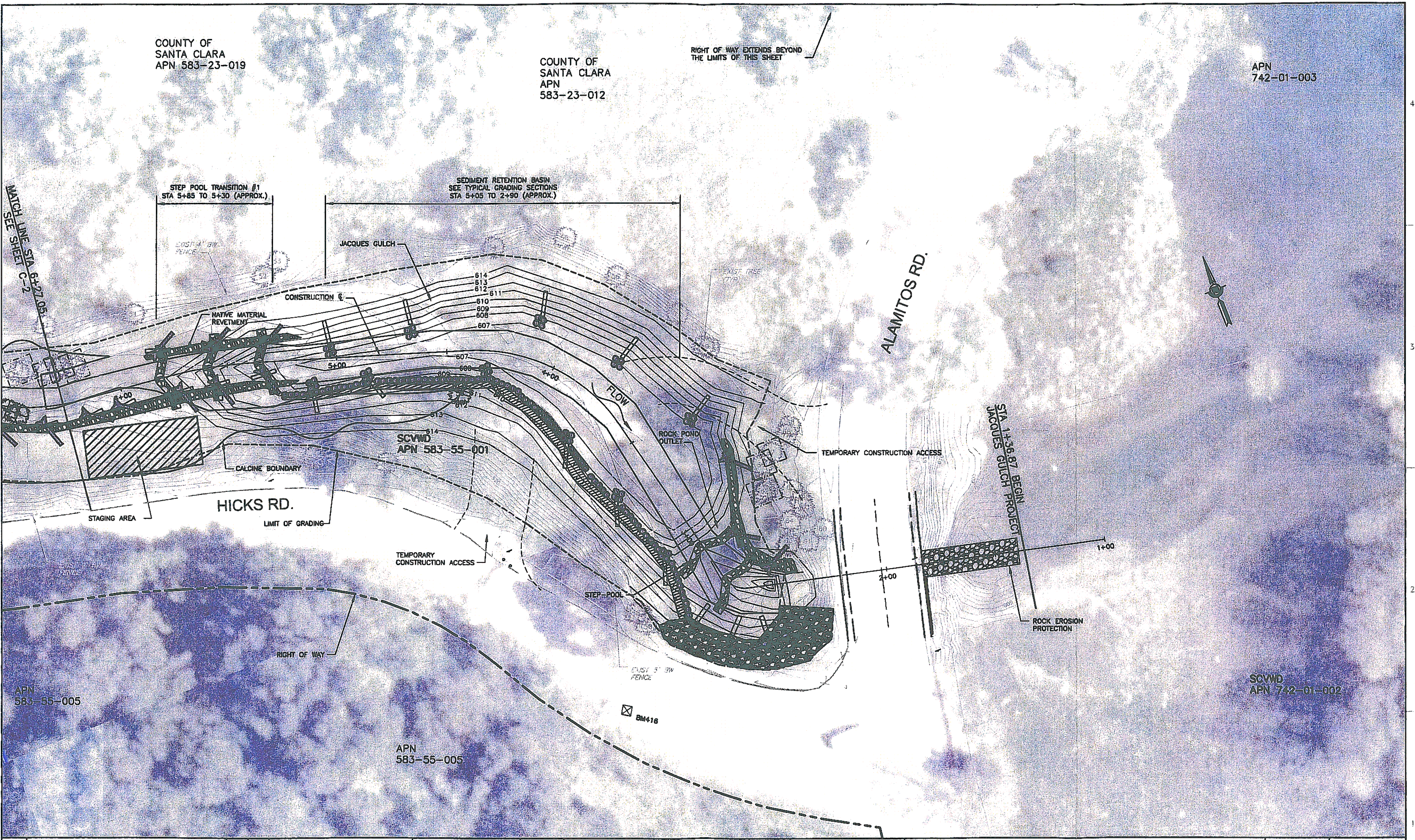
SCALE 1"=5'
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002
SHEET CODE: L-8
PAGE NUMBER: 38 OF 38

K:\Active Projects\WP-91854002\Jacques_Gulch\sheets\L-08.dwg 7-18-08 03:03:55 PM

Appendix E

CONCEPTUAL DRAWINGS FOR ALTERNATIVES



REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

CLEARWATER HYDROLOGY
2974 Adeline Street
Berkeley, California
PH: (510) 841-1836

DATE	04-02-08
DESIGN	WV/NM
DRAWN	NM
CHECKED	WV

ENGINEERING CERTIFICATION
REGISTERED PROFESSIONAL ENGINEER
MICHAEL STUART THOMAS
CIVIL
STATE OF CALIFORNIA
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
07/10/08
PROJ. MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 2

SITE A RESTORATION PLAN

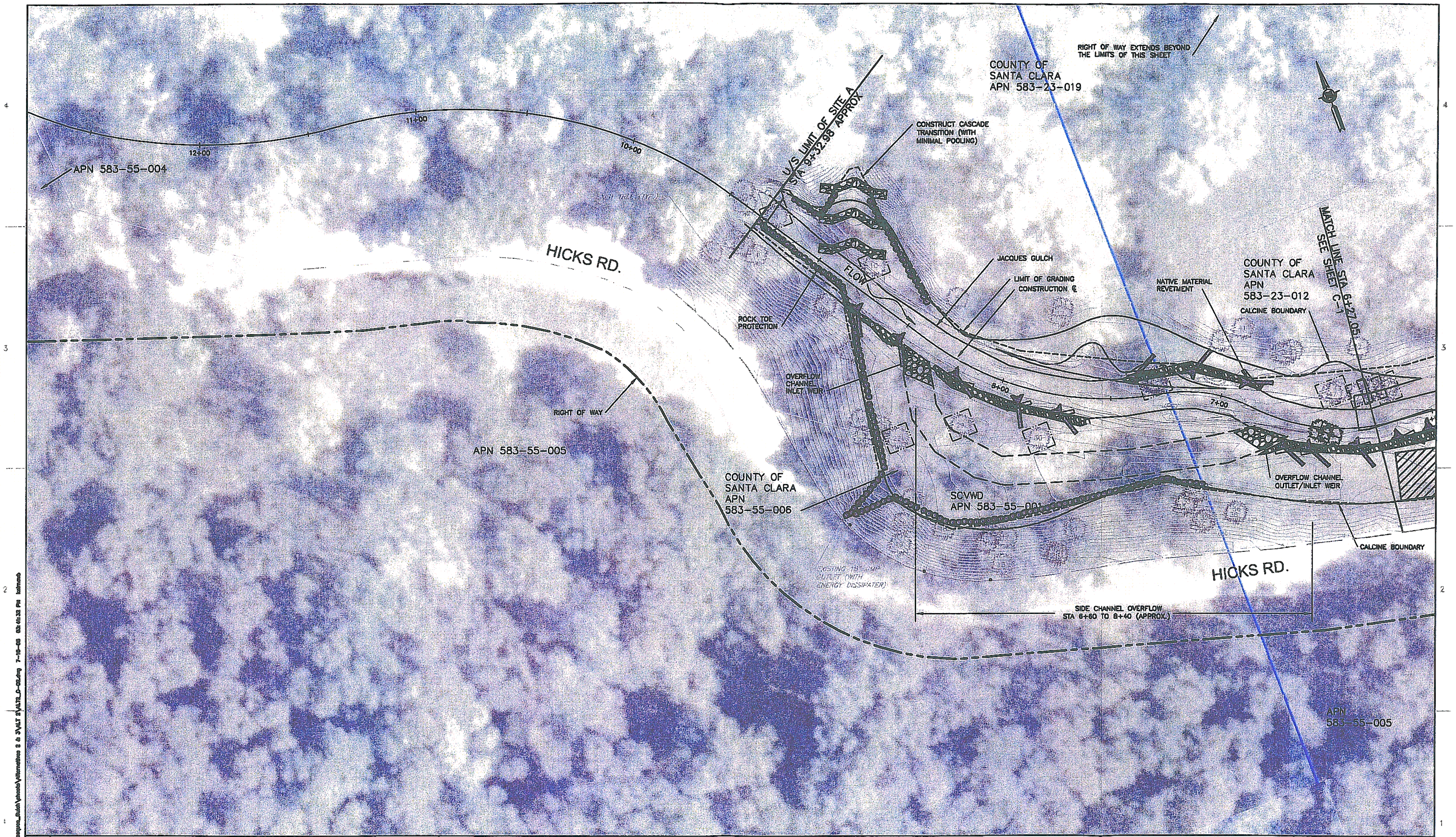
SCALE
1"=20'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002

SHEET CODE:
C-1

PAGE NUMBER:
1 OF 6


RIGHT OF WAY EXTENDS BEYOND THE LIMITS OF THIS SHEET
COUNTY OF SANTA CLARA APN 583-23-019
U/S LIMIT OF SITE A STA 9+32.98 APPROX
CONSTRUCT CASCADE TRANSITION (WITH MINIMAL POOLING)
11+00
12+00
10+00
APN 583-55-004
HICKS RD.
FLOW
JACQUES GULCH
LIMIT OF GRADING
CONSTRUCTION ℄
NATIVE MATERIAL REVETMENT
COUNTY OF SANTA CLARA APN 583-23-012
CALCINE BOUNDARY
MATCH LINE STA 6+27.05 SEE SHEET C-1
ROCK TOE PROTECTION
OVERFLOW CHANNEL INLET WEIR
8+00
7+00
RIGHT OF WAY
APN 583-55-005
COUNTY OF SANTA CLARA APN 583-55-006
SCVWD APN 583-55-001
OVERFLOW CHANNEL OUTLET/INLET WEIR
CALCINE BOUNDARY
EXISTING 18" CMP OUTLET (WITH ENERGY DISSIPATER)
HICKS RD.
SIDE CHANNEL OVERFLOW STA 6+60 TO 8+40 (APPROX.)
APN 583-55-005

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

CLEARWATER HYDROLOGY
2974 Adeline Street
Berkeley, California
PH: (510) 841-1836

DATE	04-02-08
DESIGN	WV/NM
DRAWN	NM
CHECKED	WV

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
07/10/08
PROJ MM/DD/YY

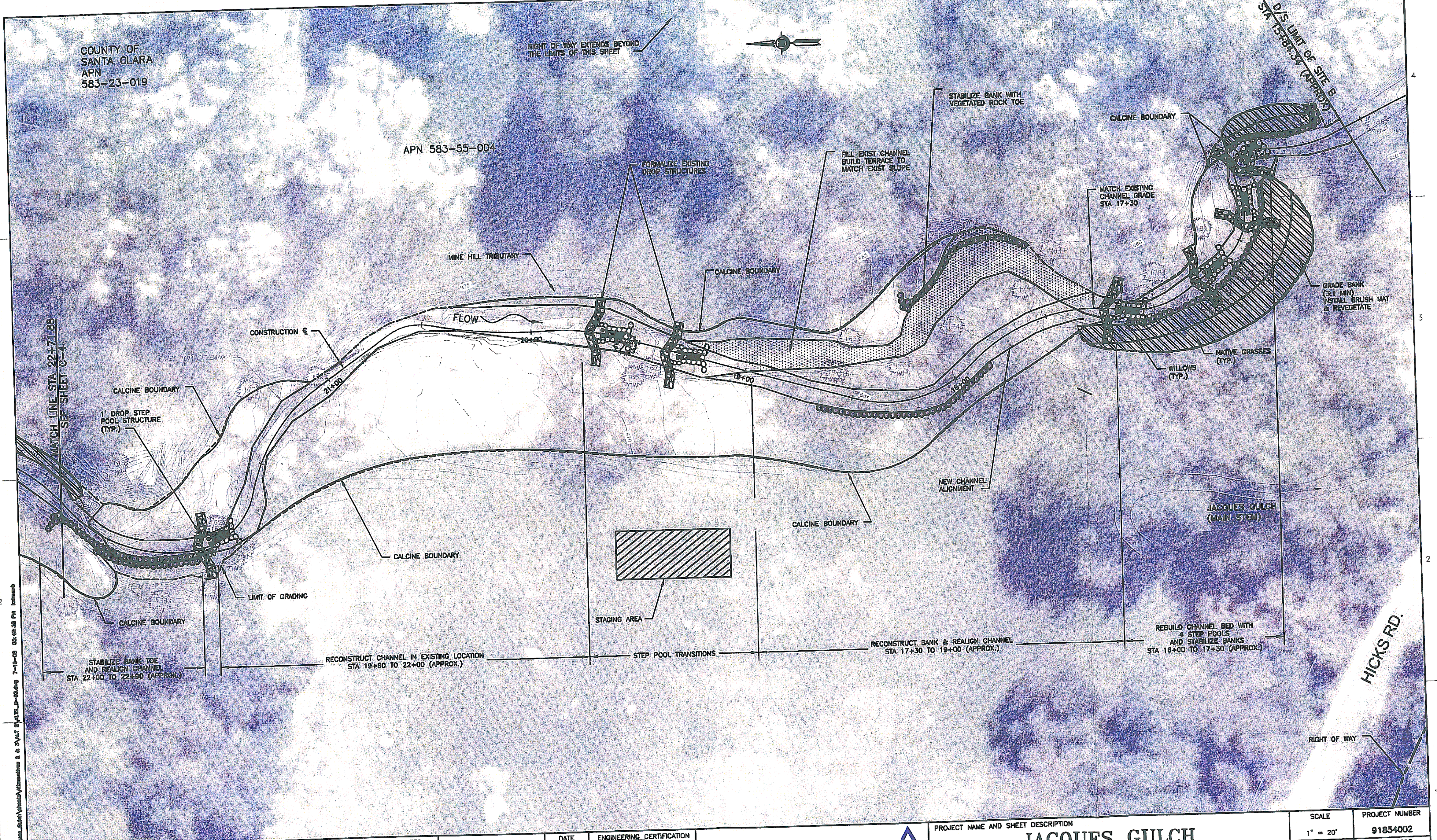
PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 2

SITE A RESTORATION PLAN

SCALE	1"=20'
VERIFY SCALES	0 1" BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY
PROJECT NUMBER	91854002
SHEET CODE:	C-2
PAGE NUMBER:	2 OF 6



REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

NOTES:

1. REFER TO SHEETS C-14 AND C-15 (ALT. 1 – RECOMMENDED PROJECT) FOR TEMPORARY CONSTRUCTION ACCESS.

PWA
PHILIP WILLIAMS & ASSOCIATES, LTD.
720 CALIFORNIA STREET, SUITE 600
SAN FRANCISCO, CALIFORNIA 94108-2404
PHONE (415) 262-2300 FAX (415) 262-2303

DATE	04-02-08
DESIGN	A. COLLISON
DRAWN	P. LUECKING
CHECKED	A. COLLISON

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 07/10/09
07/10/08
PROJECT ENGINEER DATE

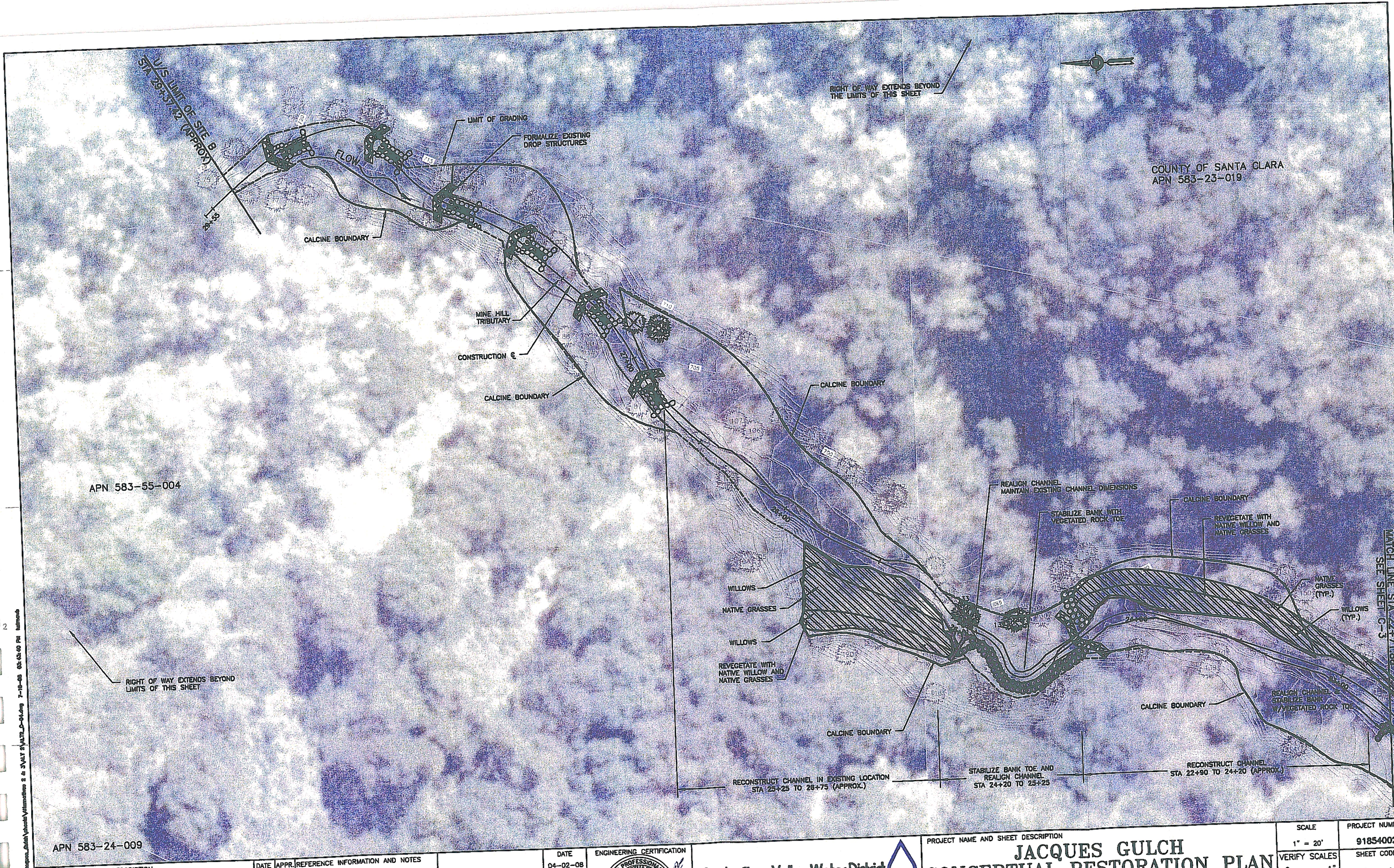
Santa Clara Valley Water District
ACCEPTED BY DISTRICT
07/10/08
PROJ. MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 2
SITE B RESTORATION PLAN

SCALE
1" = 20'
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002
SHEET CODE:
C-3
PAGE NUMBER:
3 OF 6


U/S LIMIT OF SITE B
STA 29+37.42 (APPROX)
29+55
FLOW
LIMIT OF GRADING
FORMALIZE EXISTING DROP STRUCTURES
RIGHT OF WAY EXTENDS BEYOND THE LIMITS OF THIS SHEET
COUNTY OF SANTA CLARA
APN 583-23-019
CALCINE BOUNDARY
MINE HILL TRIBUTARY
CONSTRUCTION ℄
27+00
CALCINE BOUNDARY
CALCINE BOUNDARY
APN 583-55-004
26+00
REALIGN CHANNEL
MAINTAIN EXISTING CHANNEL DIMENSIONS
STABILIZE BANK WITH VEGETATED ROCK TOE
CALCINE BOUNDARY
REVEGETATE WITH NATIVE WILLOW AND NATIVE GRASSES
MATCH LINE STA 22+71.88
SEE SHEET C-3
WILLOWS
NATIVE GRASSES
WILLOWS
REVEGETATE WITH NATIVE WILLOW AND NATIVE GRASSES
NATIVE GRASSES (TYP.)
WILLOWS (TYP.)
24+00
23+00
REALIGN CHANNEL & STABILIZE BANK W/VEGETATED ROCK TOE
CALCINE BOUNDARY
CALCINE BOUNDARY
RIGHT OF WAY EXTENDS BEYOND LIMITS OF THIS SHEET
RECONSTRUCT CHANNEL IN EXISTING LOCATION
STA 25+25 TO 26+75 (APPROX.)
STABILIZE BANK TOE AND REALIGN CHANNEL
STA 24+20 TO 25+25
RECONSTRUCT CHANNEL
STA 22+90 TO 24+20 (APPROX.)
APN 583-24-009
1
2
3
4

REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

PWA
PHILIP WILLIAMS & ASSOCIATES, LTD.
720 CALIFORNIA STREET, SUITE 600
SAN FRANCISCO, CALIFORNIA 94108-2404
PHONE (415) 262-2300 FAX (415) 262-2303

DATE
04-02-08
DESIGN
A. COLLISON
DRAWN
P. LUECKING
CHECKED
A. COLLISON

ENGINEERING CERTIFICATION
REGISTERED PROFESSIONAL ENGINEER
MICHAEL STUART THOMAS
No. C48867
Exp. 09/30/09
CIVIL
STATE OF CALIFORNIA
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
MM/DD/YY
PROJ...

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 2

SITE B RESTORATION PLAN

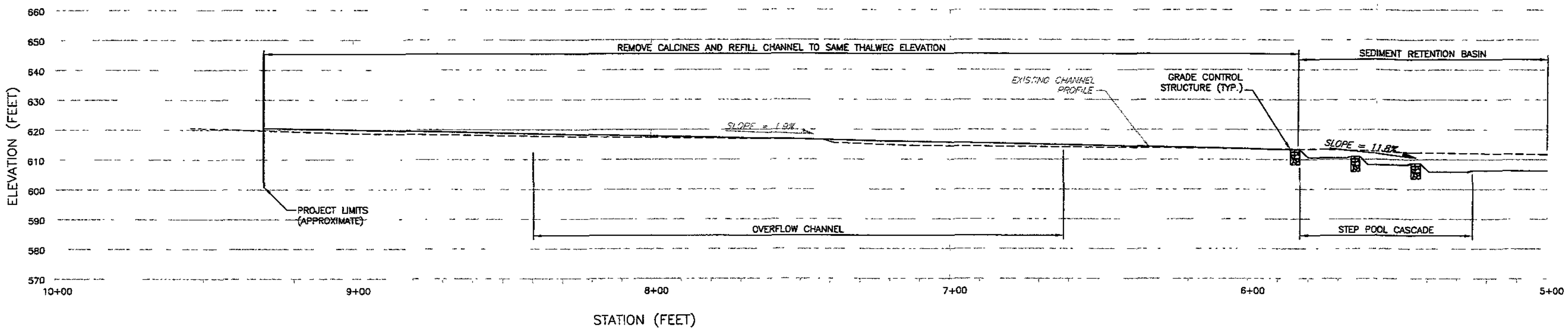
SCALE
1" = 20'

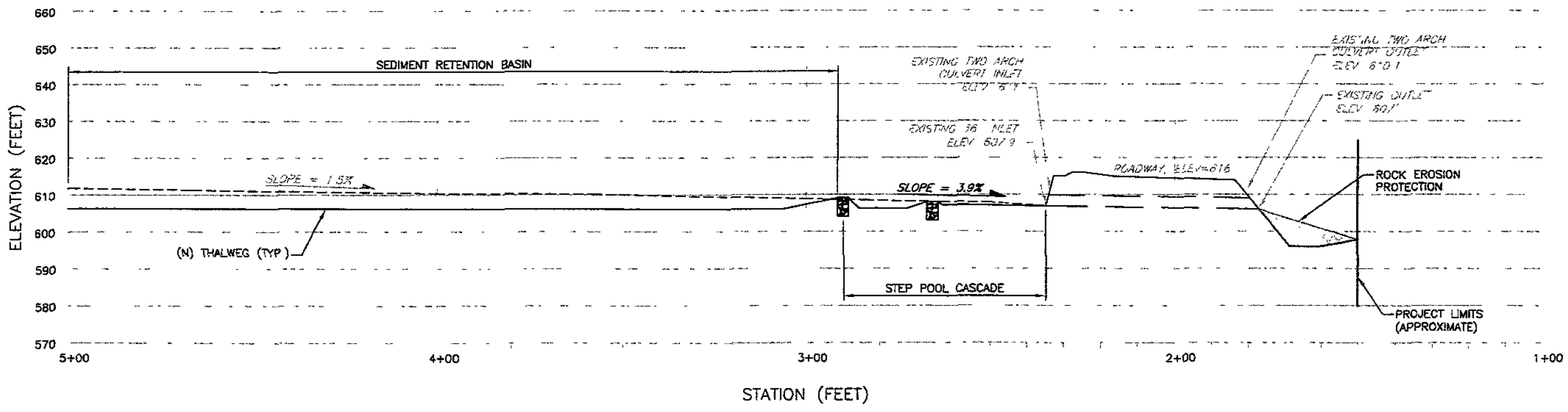
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002

SHEET CODE:
C-4

PAGE NUMBER:
4 OF 6





REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

CLEARWATER HYDROLOGY
2974 Adeline Street
Berkeley, California
PH: (510) 841-1836

DATE 04-02-08
DESIGN WV/NM
DRAWN NM
CHECKED WV

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
No. C48957
Exp. 09/30/09
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
PRO 07/10/08 MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 2

SITE A LONGITUDINAL PROFILE

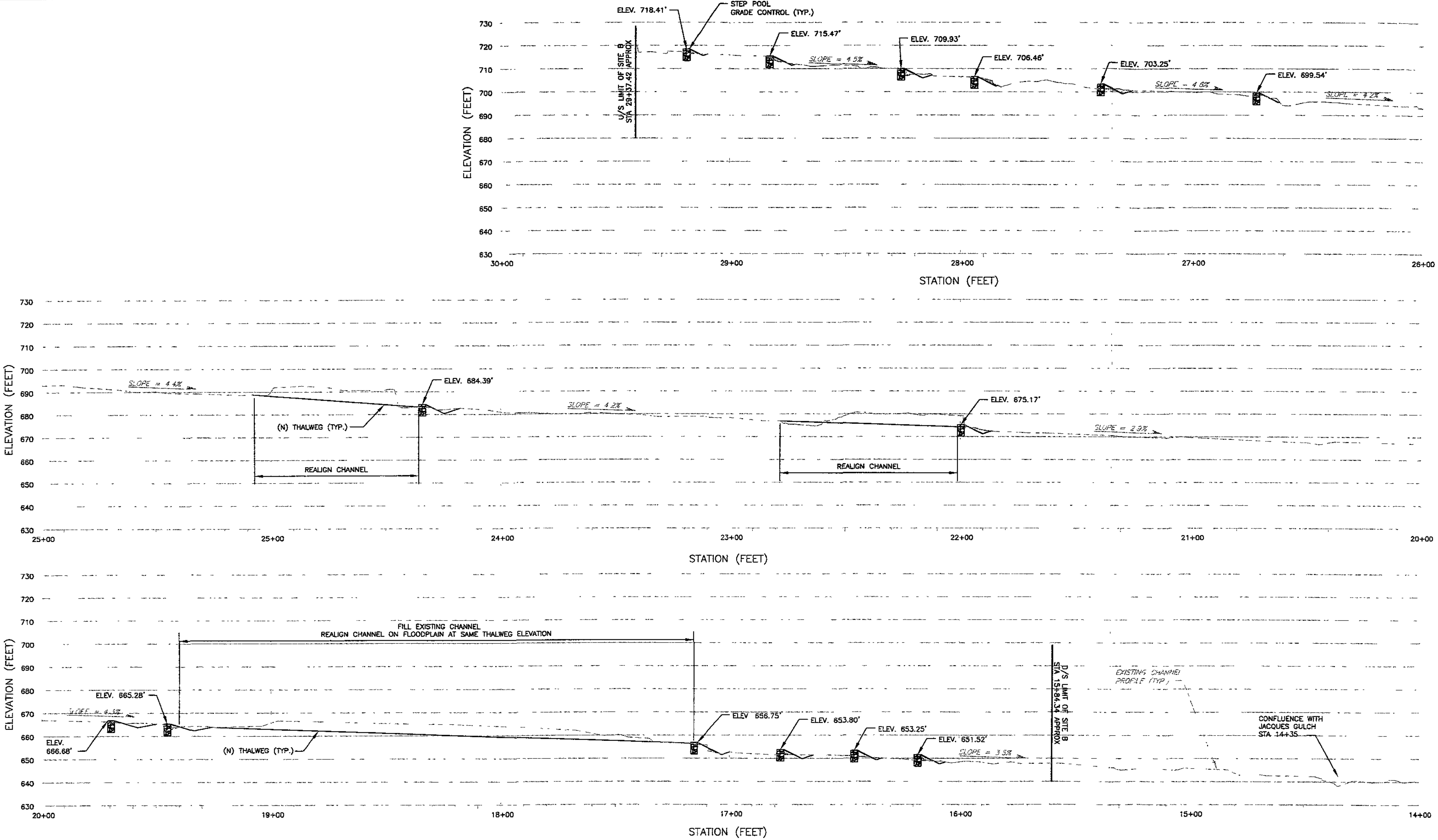
SCALE 1"=20'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002

SHEET CODE: C-5

PAGE NUMBER: 5 OF 6



STATION (FEET)

SITE B

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

PWA
PHILIP WILLIAMS & ASSOCIATES, LTD.
720 CALIFORNIA STREET, SUITE 600
SAN FRANCISCO CALIFORNIA 94108-2404
PHONE (415) 262-2300 FAX (415) 262-2303

DATE	04-02-08
DESIGN	A. COLLISON
DRAWN	E. WISNOSKY
CHECKED	A. COLLISON

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
No. C46857
Exp. 09/30/09
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
PROJ. MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 2

SITE B LONGITUDINAL PROFILE

SCALE
1" = 20'

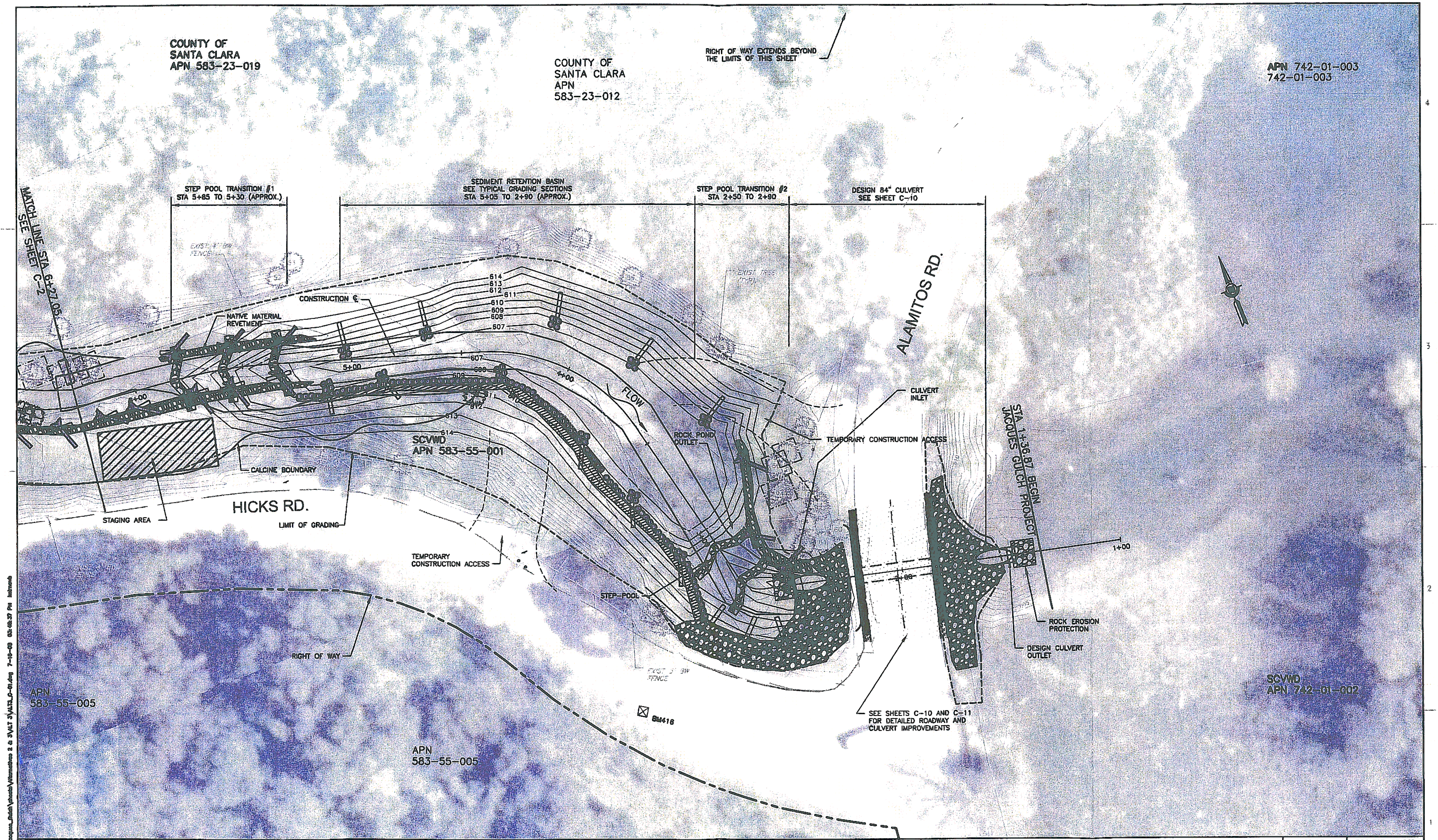
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002

SHEET CODE:
C-6

PAGE NUMBER:
6 OF 6

K:\Active Projects\WP-91854002\Jacques_Gulch\sheets\Alternatives 2 & 3\ALT 2\ALT2_D-08.dwg 7-10-08 04:03:28 PM [illegible]



REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

CLEARWATER HYDROLOGY
2974 Adeline Street
Berkeley, California
PH: (510) 841-1836

DATE 04-02-08
DESIGN WV/NM
DRAWN NM
CHECKED WV

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
No. C49867
Exp. 09/30/09
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
07/10/08
PROJ. MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

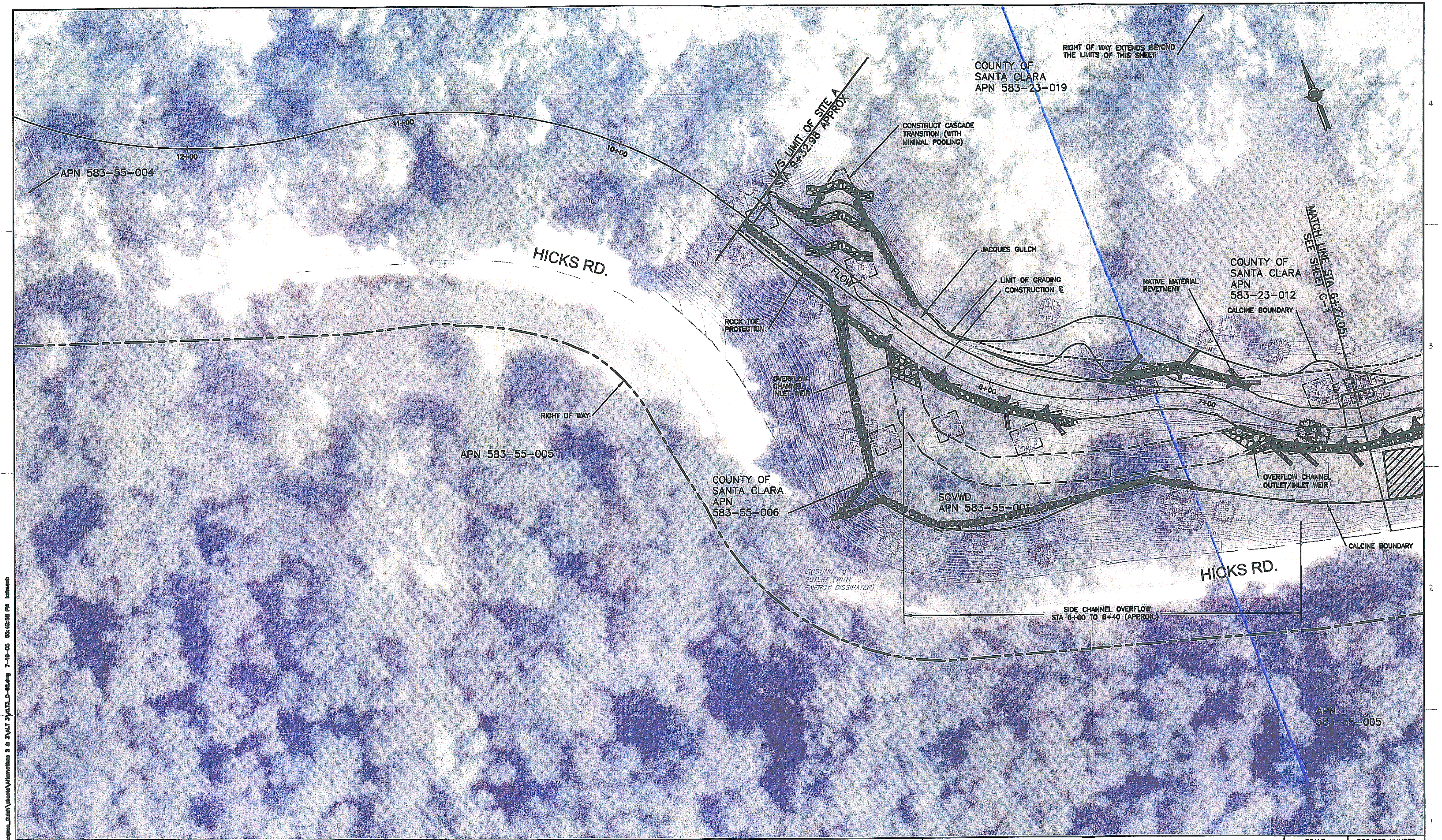
JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 3

SITE A RESTORATION PLAN

SCALE 1"=20'
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002
SHEET CODE: C-1
PAGE NUMBER: 1 OF 6


RIGHT OF WAY EXTENDS BEYOND THE LIMITS OF THIS SHEET
COUNTY OF SANTA CLARA APN 583-23-019
APN 583-55-004
12+00
11+00
10+00
U/S LIMIT OF SITE A STA 9+32.98 APPROX
CONSTRUCT CASCADE TRANSITION (WITH MINIMAL POOLING)
HICKS RD.
JACQUES GULCH
FLOW
LIMIT OF GRADING CONSTRUCTION ℄
NATIVE MATERIAL REVETMENT
COUNTY OF SANTA CLARA APN 583-23-012
MATCH LINE STA 6+27.05 SEE SHEET C-1
CALCINE BOUNDARY
ROCK TOE PROTECTION
OVERFLOW CHANNEL INLET WEIR
8+00
7+00
RIGHT OF WAY
APN 583-55-005
COUNTY OF SANTA CLARA APN 583-55-006
SCVWD APN 583-55-001
OVERFLOW CHANNEL OUTLET/INLET WEIR
CALCINE BOUNDARY
EXISTING CMP OUTLET (WITH ENERGY DISSIPATER)
HICKS RD.
SIDE CHANNEL OVERFLOW STA 6+60 TO 8+40 (APPROX.)
APN 583-55-005
4
3
2
1

K:\Active Projects\VP-91854002\Jacques_Gulch\sheets\Alternatives 2 & 3\ALT 3\ALT3_D-02.dwg 7-10-08 03:49:53 PM bzimmerb

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

CLEARWATER HYDROLOGY
2974 Adeline Street
Berkeley, California
PH: (510) 841-1836

DATE	04-02-08
DESIGN	WV/NM
DRAWN	NM
CHECKED	WV

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
No. C49867
Exp. 09/30/09
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
PROJ MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 3

SITE A RESTORATION PLAN

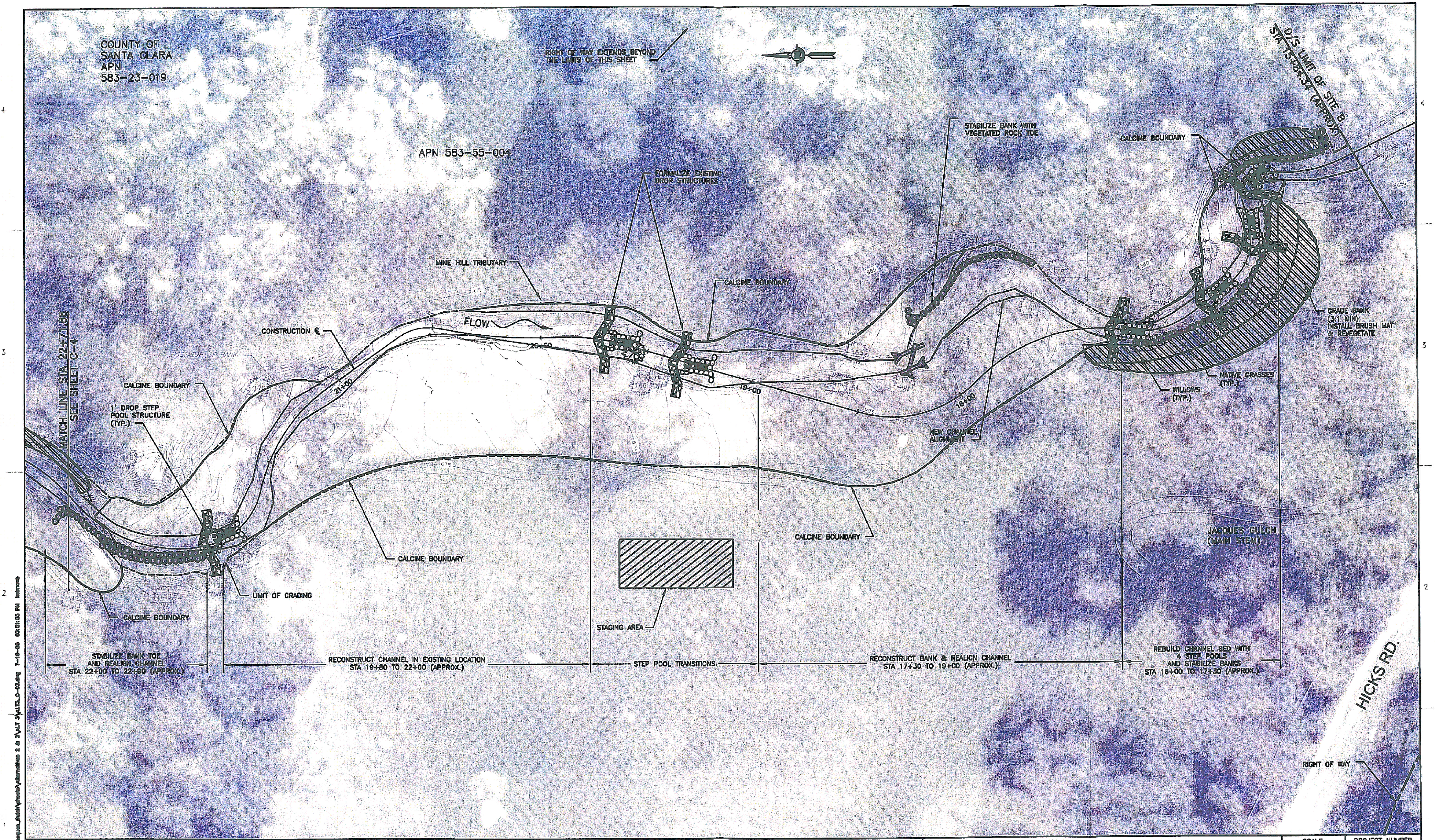
SCALE 1"=20'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002

SHEET CODE: C-2

PAGE NUMBER: 2 OF 6


COUNTY OF
SANTA CLARA
APN
583-23-019
RIGHT OF WAY EXTENDS BEYOND THE LIMITS OF THIS SHEET
D/S LIMIT OF SITE B
STA 15+86.34 (APPROX)
APN 583-55-004
STABILIZE BANK WITH VEGETATED ROCK TOE
CALCINE BOUNDARY
FORMALIZE EXISTING DROP STRUCTURES
MINE HILL TRIBUTARY
CALCINE BOUNDARY
GRADE BANK (3:1 MIN) INSTALL BRUSH MAT & REVEGETATE
CONSTRUCTION ℄
FLOW
20+00
21+00
19+00
18+00
MATCH LINE STA 22+71.88 SEE SHEET C-4
CALCINE BOUNDARY
1' DROP STEP POOL STRUCTURE (TYP.)
NATIVE GRASSES (TYP.)
WILLOWS (TYP.)
NEW CHANNEL ALIGNMENT
CALCINE BOUNDARY
CALCINE BOUNDARY
JACQUES GULCH (MAIN STEM)
LIMIT OF GRADING
CALCINE BOUNDARY
STAGING AREA
STABILIZE BANK TOE AND REALIGN CHANNEL STA 22+00 TO 22+90 (APPROX.)
RECONSTRUCT CHANNEL IN EXISTING LOCATION STA 19+80 TO 22+00 (APPROX.)
STEP POOL TRANSITIONS
RECONSTRUCT BANK & REALIGN CHANNEL STA 17+30 TO 19+00 (APPROX.)
REBUILD CHANNEL BED WITH 4 STEP POOLS AND STABILIZE BANKS STA 16+00 TO 17+30 (APPROX.)
HICKS RD.
RIGHT OF WAY

REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

NOTES

1. REFER TO SHEETS C-14 AND C-15 (ALT. 1 – RECOMMENDED ALTERNATIVE) FOR TEMPORARY CONSTRUCTION ACCESS.

PWA
PHILIP WILLIAMS & ASSOCIATES, LTD.
720 CALIFORNIA STREET, SUITE 600
SAN FRANCISCO, CALIFORNIA 94108-2404
PHONE (415) 262-2300 FAX (415) 262-2303

DATE 04-02-08
DESIGN A. COLLISON
DRAWN P. LUECKING
CHECKED A. COLLISON

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 09/30/09
CIVIL
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
PROJ MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 3

SITE B RESTORATION PLAN

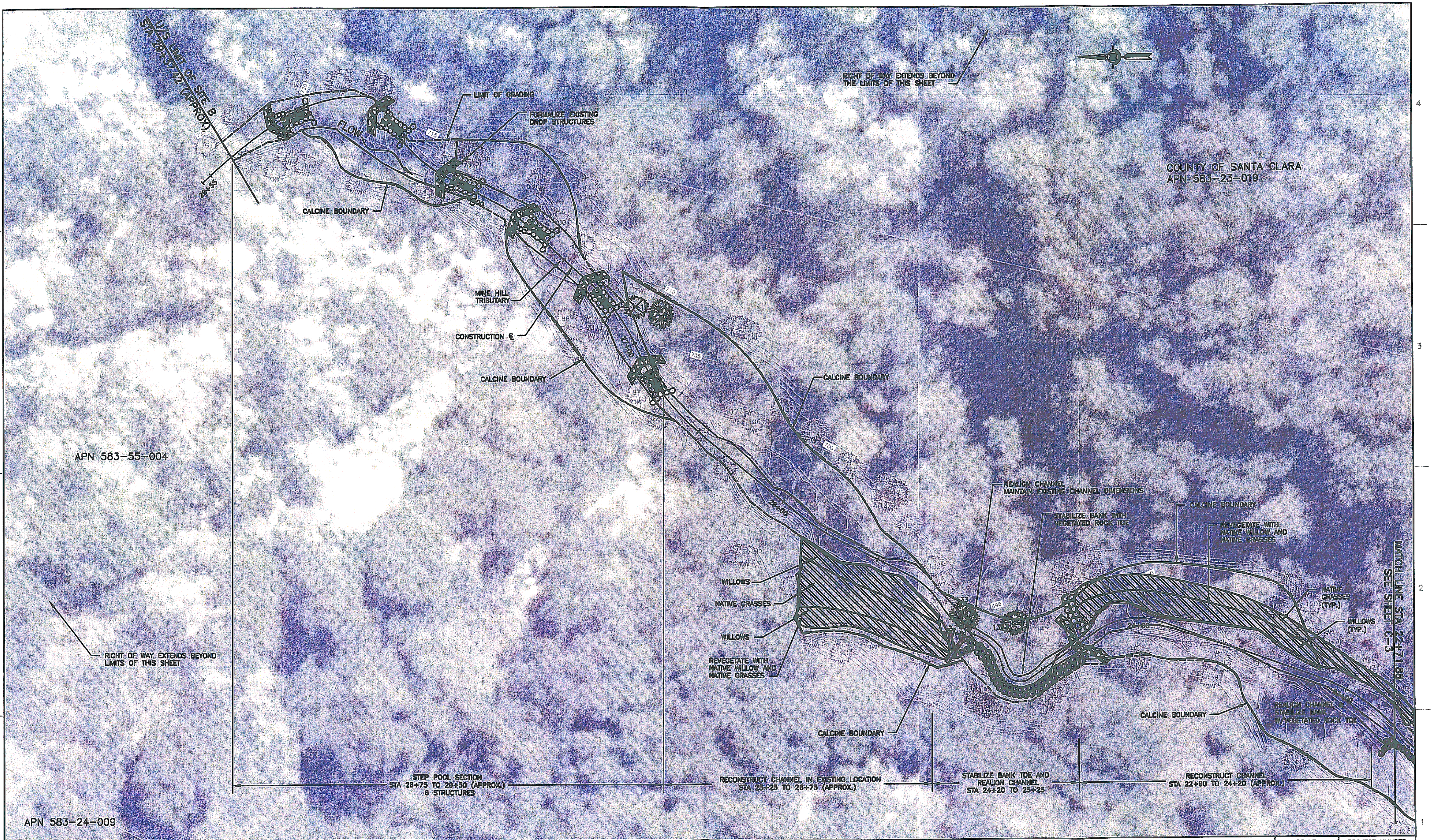
SCALE 1" = 20'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002

SHEET CODE: C-3

PAGE NUMBER: 3 OF 6



REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

PWA
PHILIP WILLIAMS & ASSOCIATES, LTD.
720 CALIFORNIA STREET, SUITE 600
SAN FRANCISCO, CALIFORNIA 94108-2404
PHONE (415) 262-2300 FAX (415) 262-2303

DATE 04-02-08
DESIGN A. COLLISON
DRAWN P. LUECKING
CHECKED A. COLLISON

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
No. C49067
Exp. 09/30/09
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

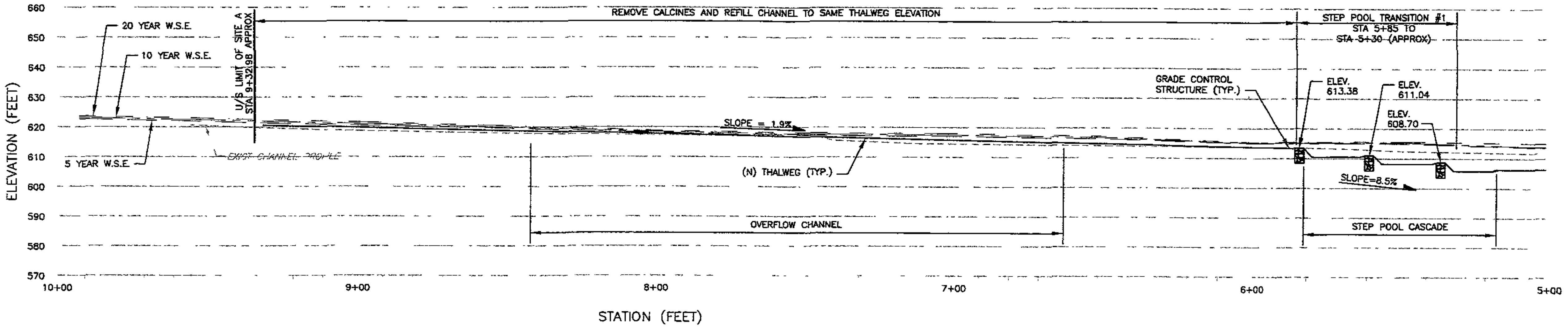
JACQUES GULCH CONCEPTUAL RESTORATION PLAN

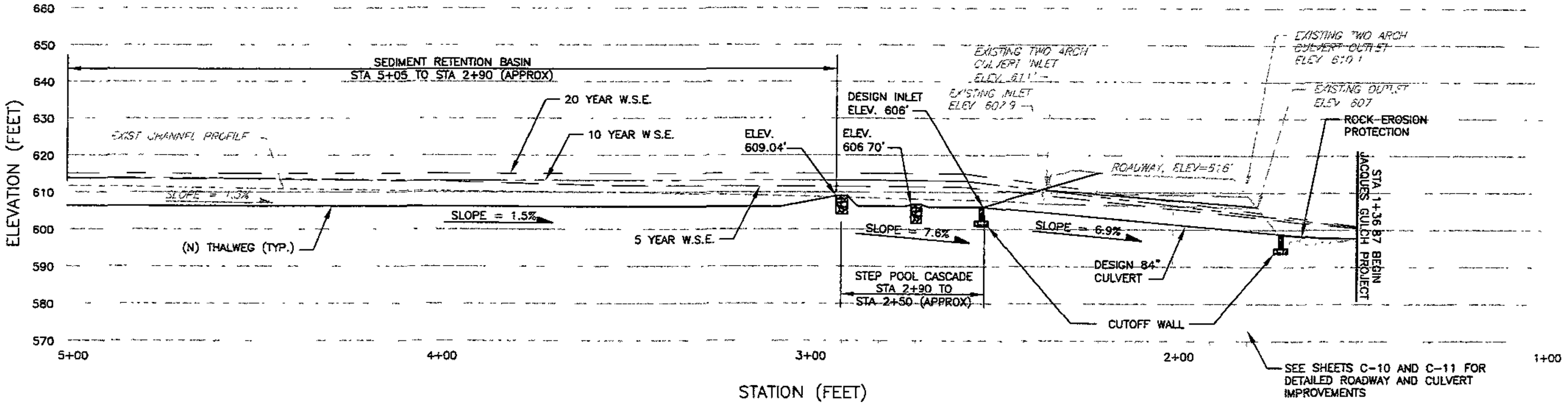
ALTERNATIVE 3

SITE B RESTORATION PLAN

SCALE 1" = 20'
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER 91854002
SHEET CODE: C-4
PAGE NUMBER: 4 OF 6





SITE A

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08			

CLEARWATER
HYDROLOGY
2974 Adeline Street
Berkeley, California
PH: (510) 841-1836

DATE
04-02-08
DESIGN
WV/NM
DRAWN
NM
CHECKED
WV

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
Exp. 09/30/09
CIVIL
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District

ACCEPTED BY DISTRICT
07/10/08
PRO. MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN

ALTERNATIVE 3

SITE A LONGITUDINAL PROFILE

SCALE
1"=20'

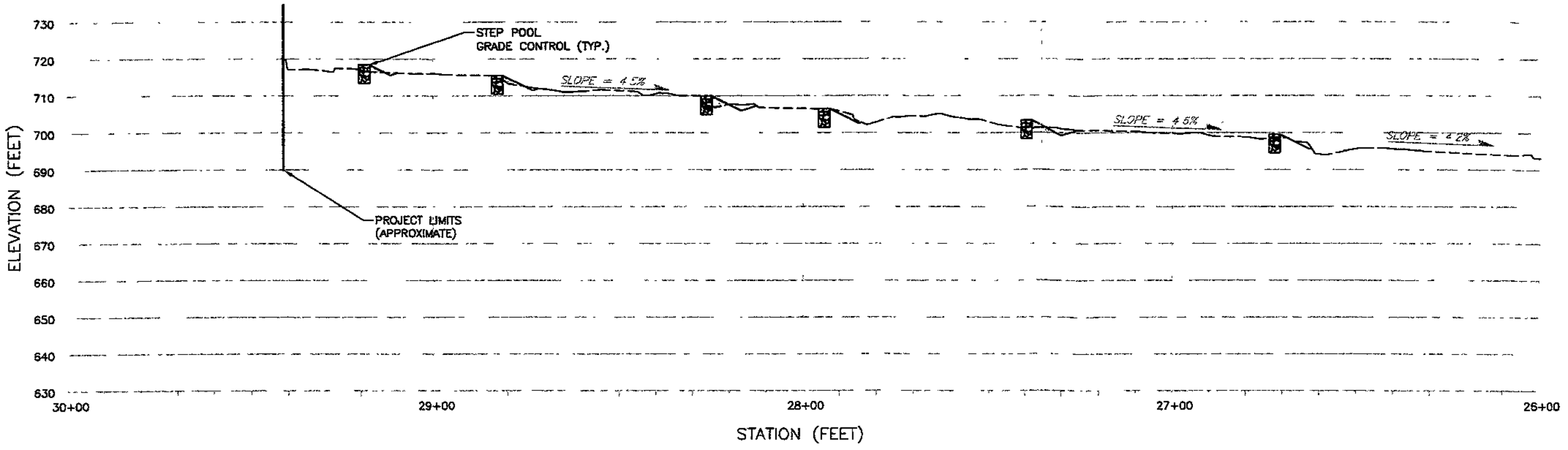
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

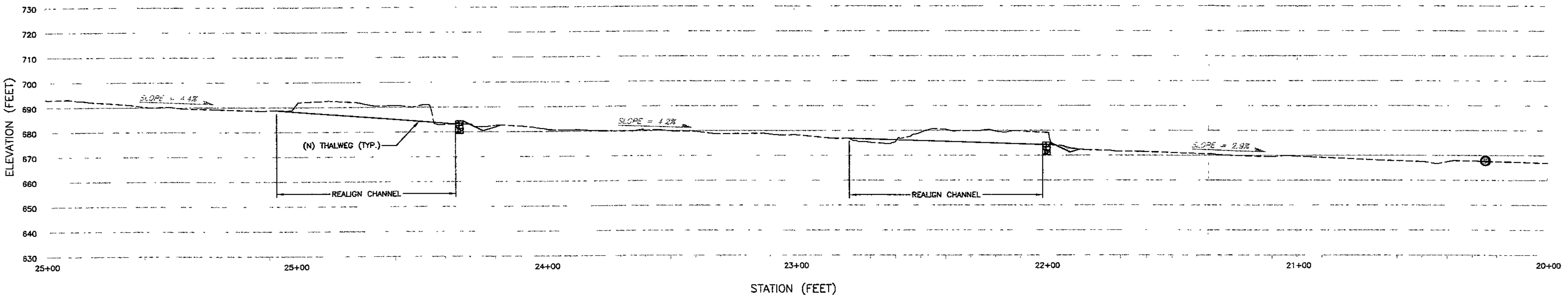
PROJECT NUMBER
91854002

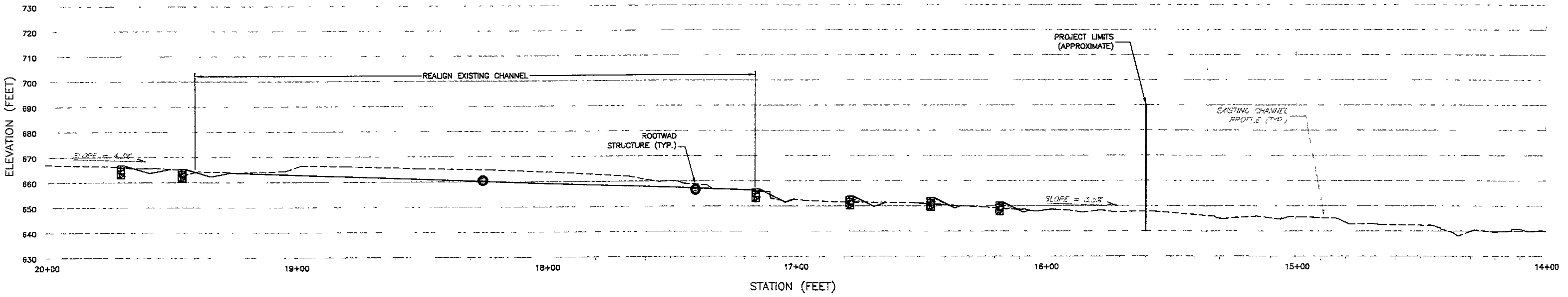
SHEET CODE:
C-5

PAGE NUMBER:
5 OF 6

K:\Active Projects\WP-91854002\Jacques_Gulch\sheets\Alternatives 2 & 3\ALT 3\ALT3_C-05.dwg 7-10-08 03:52:49 PM kelmore







REV	DESCRIPTION	DATE	APPR.
	PRELIMINARY NOT FOR CONSTRUCTION 07/10/08		

REFERENCE INFORMATION AND NOTES

PWA
PHILIP WILLIAMS & ASSOCIATES, LTD.
720 CALIFORNIA STREET SUITE 600
SAN FRANCISCO, CALIFORNIA 94108-2404
PHONE (415) 262-2300 FAX (415) 262-2303

DATE	04-02-08
DESIGN	A. COLLISON
DRAWN	E. WISNOSKY
CHECKED	A. COLLISON

ENGINEERING CERTIFICATION
MICHAEL STUART THOMAS
No. C49957
Exp. 09/30/09
07/10/08
PROJECT ENGINEER DATE

Santa Clara Valley Water District
ACCEPTED BY DISTRICT
07/10/08
PROJECT ENGINEER MM/DD/YY

PROJECT NAME AND SHEET DESCRIPTION

JACQUES GULCH
CONCEPTUAL RESTORATION PLAN
ALTERNATIVE 3
SITE B LONGITUDINAL PROFILE

SCALE
1" = 20'

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
91854002

SHEET CODE:
C-6

PAGE NUMBER:
6 OF 6

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